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To be Educated or Not to be Educated?

Frank M. Leavitt

THERE are certain recurrent questions relating to education which have never been, perhaps never can be permanently, answered. The more important of these, and especially pertinent to our discussion, are, to whom shall education be given, who shall give the education, why shall it be given, and of what shall it consist?

One who thinks deeply regarding these questions will be convinced that the subject is a complicated one. Little by little it will appear, I believe, that there are two conflicting points of view. The first is that the individual is to be educated for his own benefit; the second, that he is to be educated for the benefit of society.

Comenius was perhaps the first of modern educators to state, as he did, about 1630, the principle of parental responsibility for the education of the child. It would seem natural that education resulting from such responsibility, would have in mind chiefly the well-being of the individual. It might, and under some conditions, actually does so equip the individual that he can get more than his share of the good things of life.

But another principle has been advanced, and that is the responsibility of the state. The state is held somewhat responsible both for furnishing the education, and for requiring the individual to submit himself to the process of being educated.

Another fact must be noted at this point. There is today, and always has been, a difference of opinion as to just what experiences, educational and occupational, for youths between twelve and eighteen, will be to the best ultimate advantage of the individual. It happens, therefore, that the position and progress of the youth between twelve and eighteen or twenty are the resultant of two forces, one tending to hold him in school; the other tending to draw him into occupational life.

Each of these forces is complex and deserves at least a brief analysis.

Among the most important influences tending to hold the individual in school, until his eighteenth or twentieth year, may be mentioned the following:

Tradition in this country confers a certain distinction on those people who have had extended connection with educational institutions. The professional man, or even the college graduate just because he *is* a college graduate, is looked upon as in a sense superior to, or distinguished from, all others.

Then there are various and genuine personal advantages which come with traditional education. These advantages are comprehensible to, and highly prized by, the true educator. In proportion as he is impressed with the value of personal culture and literary learning, he sincerely desires these for all pupils who come under his care, and he conscientiously and persistently influences them to secure this prolonged period of schooling.

Another factor which must be reckoned with, is that the school affords an asylum for those youths who are disinclined to take up the real burdens of the work of the world; and also for those whose parents who, being too busy to decide for themselves the best means of educating their children, hand them over to the care of some educational institution, as the easiest way, whether that institution is equipped to develop the particular individual or not.

In opposition to these influences are to be noted certain others which tend to draw children or youths away from school. There is a constant demand on the part of industry for the labor of children and young people. Part of this demand comes from the desire to secure labor at a cost which is less than its real value, and part of it arises because certain industrial processes can be learned more readily by children than by adults.

Then there is a genuine need that some children contribute to their own support as early in life as possible. Under the present economic system, it is not probable that all children can be maintained in idleness until eighteen years of age without charity, or without a considerable extension of socialistic ideals.

Again there are types of young people who respond much more quickly to the educational opportunities of real work than to the stimuli of school conditions and requirements. While there are educators who extol the training which comes thru work, and while many attempts have been made to secure these advantages for the school curriculum, the general lack of concrete work in the schools drives many youths to early occupations.

As noted above, we have here two groups of forces which are determining the amount of school training which each individual receives.

Society is coming to see that there are certain dangers which will arise, if the *second* group of in-

fluences becomes too strong. It sees that it is futile to continue to turn a stream of child workers into occupations which are paying *adults* less than a living wage, thus necessitating the consignment of *their* children, in turn, to industry at the earliest possible age.

Even some of our farsighted employers believe that the future of industry stands in doubt if we are to continually recruit its ranks *only* from those consigned to it by poverty, inexperience, and lack of personal initiative. Instead, society must see to it that at least a saving minority shall enter industry because they *choose* to do so, and then enter it only when properly equipped to cope with the difficulties presented by our complex industrial system, difficulties technical, social and personal.

I believe that the phenomenon which we call the demand for industrial education is a sincere attempt to hold true the balance between the two groups of forces described above, and that this result will be obtained most effectively where industrial training is given in close proximity to other types of school work.

Let us make no mistake. No education has ever been given which has not contained elements of both general and specific training, of both liberal and vocational education. Even the most specialized form of industrial training has invariably carried with it some general, intellectual development. Work given as "industrial" education, which leaves the worker with the same mental equipment he possessed at the beginning, cannot be classified as "education" at all. In other words, industrial education has always carried with it, even if only as a by-product, a considerable degree of general training. Its tendency is to ally itself with the group of influences which holds the youth in school. To the question, "Shall this youth be educated?", it replies "Yes".

What is industrial training, and how has it grown to its present status as a factor in education? By what means may it be developed still further? Is a natural growth, or a forced growth, more likely to produce a type of training which is consistent with our democratic institutions and directly beneficial to those for whom the work is being projected? These are the questions which it is the purpose of this article to discuss.

What is industrial training? As a basis for discussion, let us define it simply as "education for the industrial worker". Enlarging somewhat upon this definition, we should say that the education must be appropriate for the *industrial worker;* complete so far as it is carried—that is, it must include all features, technical, general, inspirational, recreational; and that it must be dynamic, impelling the learner to desire more and more.

For centuries it was not thought necessary to "educate" *industrial workers,* or at least certain grades of industrial workers, except in so far as they were educated by, and for, their daily occupations. Even in New England, in earliest colonial days, the required schooling had no reference to the learner's economic status, but was merely intended to enable him to read the Bible and understand the common law of the land.

It was not till it became a matter of general knowledge and of social concern that the industrial workers were *not* being educated, in any sense of the word, that the demand arose for "industrial" education. It was natural, therefore, that the initial steps toward industrial education should have been taken in a community where the industrial workers formed a large and important part of the population. Industrial development and density of population are generally co-existent; in fact, density of population may well be taken as *evidence* of industrial development and of the presence of masses of industrial workers.

Lessons from Massachusetts.

Relatively few people who have drawn lessons in industrial education, from the experiences of the state of Massachusetts, have realized that the state is one of the most densely populated regions in the world. Barring Rhode Island, which is practically all urban, Massachusetts is the most densely populated state in the nation. Compared with Indiana, one of the states which has based its industrial education laws on those of Massachusetts, we find 419 inhabitants to the square mile in Massachusetts as against 75 in Indiana. These figures are taken from the 1910 census, but the industrialism of the state is of long standing and has had much to do with the development of educational methods and ideals in that commonwealth.

In fact, in the light of our simple definition, we might say that the first "industrial education" law was passed in 1852 when Massachusetts put upon her statute books the first "compulsory school attendance laws" in the United States. Why may this be called an "industrial education law? It came after a period of industrial expansion. In 1820, there were engaged in manufacture in Massachusetts 33,464 people; this number had increased to 85,176 by 1840. This development had brought about not only increased opportunities for children to work, thereby drawing them away from the schools, but it also had brought to the state a new class of children whose parents were willing and anxious to have them work because their own training, or lack of it, had not been such as to make them appreciate the value of an education. In other words, the force of educational tradition was not strong with them.

By the year 1852 it had become clear that all such children must be forced into school. Thus we see that, if we accept our definition, industrial education is merely a phase in society's progress toward universal education.

Let us now come a step nearer the present. Whatever may be true about the rest of the country, Massachusetts thought she was providing a more appropriate education for her industrial workers when she first permitted the introduction of manual training in 1884, and later required it in all cities of 20,000 inhabitants or over. In the report of a school board of that state, in 1878, we read: "The question of teaching trades in our schools is one of vital importance. If New England would maintain her place as the great industrial center of the country, she must become to the United States what France is to the rest of Europe, the first in taste, the first in design, the first in skilled workmanship.

She must accustom her children from early youth to the use of tools, and give them a thoro training in the mechanic arts." True this statement makes no mention of the general education of the workers, but this was already assumed since the work was to be given to the children "early" and in the regular schools.

We are all familiar with what happened to manual training in Massachusetts, and in other states, altho some seem to overlook certain important facts in the present day discussion of the manual-training question. The work, in spite of severe educational opposition, was sparingly introduced into those schools or grades which were rarely reached by the industrial workers for whose benefit manual training was originally intended. No wonder it "failed," as some profess to believe.

After all, just what was the failure? Principally the failure to give the work to the right boys. That is, it was introduced so high up in the "system" that it was out of reach of the future industrial workers. But this was quite natural after all, this offering of choice things to those at or near the top. It was not left for industrial training to establish this precedent as we all know very well. But we know this, also, that every good thing which has been introduced at the top of our educational system has gradually percolated to the bottom and eventually the whole system has been modified by it. This, then, we may describe as the *natural* growth not only of industrial training but of every phase of popular education.

Let us next see whether there was a reasonable possibility that this process of percolation would have resulted finally in accomplishing the original purpose of industrial education. To examine this question, let us come a step nearer to the present situation, namely, to the time of the report of the Douglas Commission on Industrial and Technical Education in 1906. This report made no reference to manual training except to declare that it was academically useless. It recommended the separate industrial school uncontaminated by the influences of school teachers, or regular boards of education. To be sure, the latter requirement was soon dropped, so that today there are few, if any, special industrial boards left. Let us take the case of Boston as illustrative of the *natural* development of industrial education. Remember the question is as to whether industrial training would have worked down naturally to the pupils who needed it.

Prior to the report of the Douglas Commission, the school committee of the city of Boston had passed a rule, the purpose of which was to give over-age children in the lower grades an opportunity of receiving the instruction in manual training usually reserved for the upper grades. Individuals might be admitted to the upper-grade manual-training classes, or special sections of such boys might be organized. Altho little attention was paid to this rule at the time, it serves to indicate the tendency to carry manual or industrial training down to the people who needed it.

In the same year that the Commission made its report, the Boston School Committee established the first

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special class for boys who were "industrially inclined." Classes of this type are now called "Prevocational," and have been established in eight different elementary schools. These "Prevocational Centers," are considered a part of the regular school system, are a development of the manual-arts department, and are supported from the regular school fund.

Operating under the special law giving state aid to industrial education, Boston has established one *separate industrial school* for boys.

The prevocational centers may thus be said to represent the natural growth, and the separate industrial school the forced or specially stimulated growth of industrial education. In some respects these two types of schools are similar; in others somewhat different. A boy under fourteen may enter a prevocational class, but not the industrial school. The hours are somewhat shorter in the former than in the latter. In each type of school there are to be found both general and special instruction. The most noteworthy difference is that the prevocational boys do not have to leave the "system," and may go to high school if they graduate. The enrollment in the Industrial School is 180, against a total enrollment in the prevocational schools of 370 students.

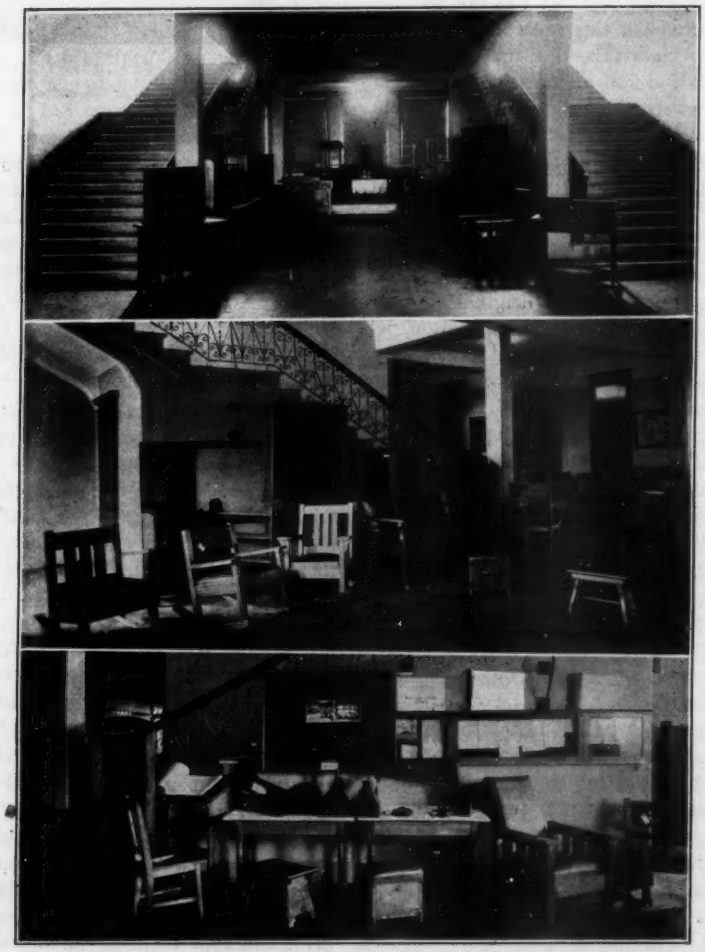
The point of all this, is that the natural growth of industrial training thru a development of the department of the manual arts has, without state aid, accomplished considerably more in the way of genuine industrial training for the fourteen-year-old boys of Boston than has the special state-aided plan. If state aid had been given this type of industrial education, on the same basis as that afforded the Industrial School, (50 per cent of the net maintenance cost), the number of boys reached could have easily been 25 per cent greater. I believe this shows that with proper direction and support, in-

dustrial education will eventually percolate down thru the "system" and reach the boys for whom it was originally intended, and will do it more effectively than if forced in from without.

I have gone at length into the historical phases of the work in Massachusetts, because nowhere else can it be so well studied. The Middle West, however, has shown its determination to bring industrial education to the future industrial workers in another way. There has been a growing tendency to offer the industrial education of the high schools to selected boys of fourteen to sixteen years, even tho these boys have not completed the work of the grades. Perhaps the best illustration is to be found in the prevocational classes in the Chicago technical-high schools. Here we find boys who have not completed the grades, engaged in some form of mechanical work ordinarily given to high-school classes, or in some highly specialized work suitable for the two-year, vocational high-school classes.

They are doing this work and also completing the essentials of the bookwork of the grades. In one high school alone there are 197 boys. It should be remembered that these boys are still in the "system" and that, in fact, many of them become regularly enrolled members of the high-school classes.

Again, it is to be noted that the industrial training, first reserved for high-school pupils, has percolated thru the "system," and is now available for those boys who really need it the most. This again is an example of the natural growth of industrial education, a growth which has been possible because of its proximity to the regular school work. And, if I have been able to understand the temper of the schoolmen in the Middle West, this kind of thing is going farther, and we shall eventually see our regular public high schools addressing themselves to the problem of serving all the children of suitable age in those "educational palaces" which are being erected so generously for high-school pupils.



MANUAL TRAINING EXHIBIT AT THE WESTERN STATE NORMAL SCHOOL, KALAMAZOO, MICH.

All of the furniture shown was designed and made last spring by students in the classes of Mr. M. J. Sherwood, director of Manual Training. The iron work is the product of a section of the forging class, taught by Mr. A. E. Bowen.

THE PURITANS.
Sand Table Made by Students of Primary Hand Work, Summer Session, Peabody College.

SUGGESTIONS FOR THANKSGIVING INDUSTRIAL WORK FOR THE ELEMENTARY SCHOOLS

Mary E. Williams, Kent, O.

THANKSGIVING time affords many opportunities for industrial work, and for work that will develop in the children the true Thanksgiving spirit.

In many schools, there needs to be a reorganization of the holiday work. I find that many teachers do hectograph work or use patterns which they give children to follow, when the pupils are able to think and construct things for themselves. They find so many holidays and special occasions when they can do work of this kind, that much time is wasted in merely doing things that make a showing. Teachers so often say "Give us something new." By this they mean something novel and striking. We do not need more novel projects for the sake of entertainment. It is not difficult to originate a piece of handwork, but it takes thought to always see the highest motives back of the work.

Since industrial arts in the elementary schools is very closely related to other school subjects, our Thanksgiving work will be such as may be used in school periods for other subjects as well as in the few minutes that most schools devote to Industrial Arts.

In our reading, literature, geography and history work, we often visit the little people of other lands. Now we might take a trip to England and visit the Puritans. In our imagination, we live thru all their hardships with them, in the mother country. In order to make the work more vital, we select some particular Puritan boy.

At this time, our third-grade pupils dramatize and draw significant incidents in the life of Ezekiel Fuller in "Ten Boys." We notice and try to remember the important date of Ezekiel's birth, for it was "Forefather's Day." We notice the event of the naming of the child and the significance of the name. We notice the tyranny of King James I, for we see the father of our little Ezekiel led away to jail, while he is quietly worshiping in his own home. We see the patient mother as she wipes away her tears and says to her children, "It is for the cause of God we suffer."

We see how serious this little boy is taught to be. We dramatize and draw the boy in his plain doublet and hose, and his peaked hat shading his thoughtful face. He certainly looks like a little old man, and our merry children cannot help smiling at him. We also draw the English boys, who, in their gay dresses, with ruffles and laces, pass by our hero and jeer at him in his sober dress. We dramatize and draw the incident where the house is broken into and Master Barton and Master Fuller are marched off to jail, and the incident where Goodman Fuller and his wife and children sit by the fire-side and plan to come to America. We see these children, sitting quietly on their own little wooden stools in the chimney corner, seriously looking and listening, for they do not dare to speak. We dramatize and draw incidents in the preparation for the journey to London and the voyage across the Atlantic. We go with them in their little storm-tossed ship across the ocean. We understand with Ezekiel, the words that the minister reads from the Psalms, "He maketh the storm to calm, so that the waves are still." We live with the Puritans in their American home, and celebrate Thanksgiving with them.

In some of our primary grades, we select some typical Puritan lad and visit him in England as we did Ezekiel. We go with him on his trip to Holland and see these people with their strange dress and peculiar customs. We embark for America with the little Pilgrim band. After braving the voyage on the little Mayflower, and being tossed by the waves and winds, we rejoice with these wanderers when they come in sight of land. After we have dramatized and drawn the incident as shown in Boughton's "Landing of the Pilgrims," we

feel that we know the spirit in which they prayed to their "Protector."

Now we must pass the hard winter in this strange land among wild animals, and savage Indians. We construct log houses and stick chimneys. Children play being soldiers and guard the little settlement. How they love to draw these soldiers! Some children are Indians who prowl around and keep these soldiers on their guard. When spring comes the Indians teach these Pilgrims how to raise corn. Corn which has been planted and tended by the children, is now gathered. Pictures are drawn of the gathering of the harvests of corn, fruit and nuts, for many things grow wild here. Baskets and boxes are made to hold the produce. The children construct bows and arrows, dress in Indian suits, and play at hunting wild turkeys.

There are always children in the community who have Indian clothes and who will be glad to pose for the class while they draw these hunting scenes. Some children dress as Puritans. The girls wear long dresses and aprons, have handkerchiefs over their shoulders and caps on their heads. These Puritan caps are made from paper. The boys wear Puritan hats and collars made from paper, and silver paper buckles on their low shoes. Thru these lessons the children live over again the lives of their Puritan ancestors and they approach the Thanksgiving season in the spirit in which the Puritans of America came to celebrate it.

Now we are ready for the great occasion, the Thanksgiving dinner. Children go hunting and bring in the turkeys to be cooked. They gather in the vegetables, fruits, nuts, etc. We plan the dinner and dramatize it, acting the parts of the quiet thoughtful Puritans.

Puritan books are made in which the most interesting pictures and the most salient parts of the story are kept. Fruits, vegetables, corn, pumpkins and harvest scenes are also represented, and the drawings and cuttings are placed in the books. Clippings are collected, such as Boughton's "Pilgrims going to church," pictures of Puritans spinning, etc., and are placed in the book. An appropriate cover is carefully designed for the book.

Some schools made Puritan sand tables. The one shown here, was made by my summer school students in Peabody College. Here, a mission is represented as the center of interest. It is built of logs and clay with a paper roofing. Near it are the old stockades in the center of which is a block house and log cabins. The procession of Puritans carrying their guns are marching home from church, while the Indians are roaming about hunting. An Indian camp is shown in the distance, and many animals and birds are represented with cuttings and clay modelings.

In one of our rooms, the children had a "Harvest Home." Here they brought vegetables, fruits, grains, etc. These were studied and tested for quality. These objects also served for lessons in drawing and design. In one of our sixth grades, we made a study of colonial interiors. Pictures of these interiors were collected for study and comparison. Walls were then drawn on cardboard. On these walls were shown the large fireplace, the tall clock, the spinning wheel and the old-fashioned furniture. The colonial doors and the latticed windows were studied and drawn. Four sides of the house were drawn and painted by each student. These cardboards were then fastened together, thus showing the whole interior of the house.

In some of our grammar grades, we made post cards, posters, etc. Here good design was required. Post cards shown on the market were noticed and criticised. Printing was also considered as part of the design, and good printing was emphasized.

In all our grades, we hope to make the Thanksgiving work, not merely a delightful pastime; but the holiday season, with the great Thanksgiving occasion, is used to vitalize the industrial work, as well as the other school subjects, and to lead the child into the true Thanksgiving spirit.

OF the two vulgarities—that of commercial dullness, and that of the blandishments which assume the name of "new art"—the latter is likely to be by far the worse. On this question of design it is essential to guard one's self from a merely capricious originality, a striving for exaggerated elegance, and an endeavor to suggest ideas of luxury, which last is probably the most enervating and repulsive characteristic of certain forms of modern taste.

W. R. Lethaby.

ART SMITHING

Thomas Googerty, Pontiac, Ill.

(Fourth Article)

Exercise No. 7.

In the making of drawer pulls, they can be of one part, the handle being fastened directly to the drawer, or they may be made of two parts, the handle and plate. The handle can be made stationary on the plate or movable. In Fig. 33 are shown some hinges, drawer pulls and key escutcheons. The open work is cut out while the stock is hot, or it may be drilled, cut and filed while the plate is cold.

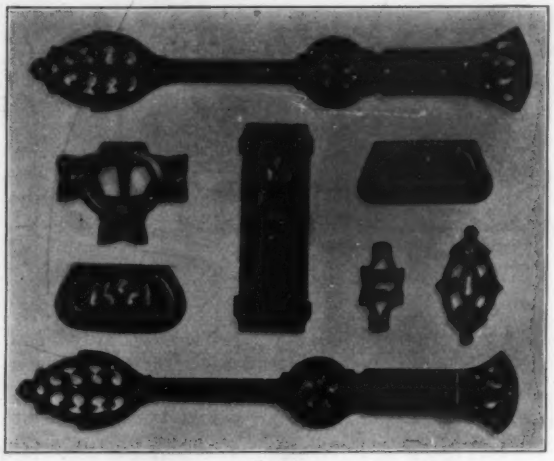


Fig. 33.

The stock used in making a plate for a pull, somewhat like those illustrated, is represented in Fig. 34. After the plate is cut to size, which is done cold with a hand chisel, the outside surface is hammered while hot with a ball hammer, drawing the plate a little thinner near the edge. This hammering gives the surface a rough texture. The edges are now ground or filed to shape and the holes are drilled as shown in the drawing. The round holes are for screws to fasten the pull, and the square holes are to fasten lugs, on which the handle is to swing. The lugs are shown in Fig. 35. The tenon

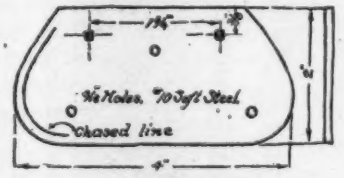


Fig. 34.

Fig. 35.

can be filed; the top rounded; the holes drilled and the lugs riveted into the plate. When riveting the lugs, they are caught in a vise, the plate set on and the tenon is riveted tight into the holes. The square holes in the plate should be countersunk a little on the back side before the lugs are riveted.

The handle is a movable one and the drawing is shown at Fig. 36. The different steps in making the handle are represented in the drawing at Fig. 37. When the stock, which should be soft steel, is cut, the ends are heated and drawn out tapering to 3/16 inch at the end. One-and-a-half inches from each end of the bar is marked with a center punch. The ends are now bent over ¼ inch, then the bar is bent at the center marks.

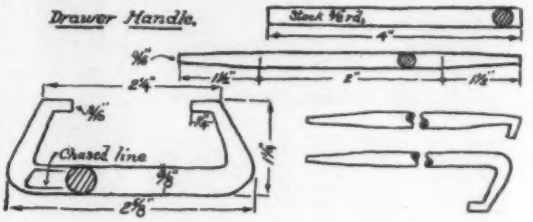


Fig. 36.

Fig. 37.

When the handle is formed to fit the plate it is smoothed with a file and if desired, a line can be chased on the handle and around the edge of plate. In doing this a short, light chisel is used. After lines are traced on the plate with a slate pencil, the chisel is set on the line and struck with a light hammer; at the same time it is drawn towards the worker with the lead corner of the cutting edge directly on and above the line.

The chisel should receive rapid, light blows and be continually moved toward the workman. The lead corner of the chisel should be guided onto the line while the other corner is doing the cutting. See Fig. 38, a

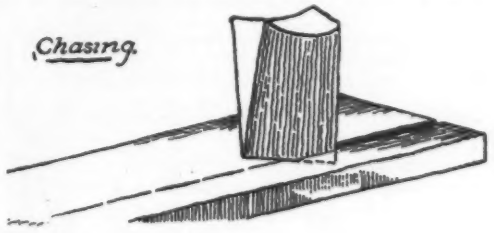


Fig. 38.

rather large sized drawing of the cutting edge of the chisel. When the lines are chased with the chisel, they should be gone over again with quite hard blows from the hammer, forcing the chisel down to make the lines quite pronounced.

To put the handle in place on the plate it is heated and sprung into the holes of the lugs. The last thing to do in finishing all work of this kind is to heat it to a dark red. All scale and dirt is then scraped off; when cool some oil is put on. For this kind of work, machine oil is good. The reason it is heated to a dark, even red heat is that when cool the handle will have the same color and texture.

Exercise No. 8.

In Fig. 39 are shown some hinges, latches and door knockers. Fig. 40 is a drawing of a simple knocker. The plate is cut out and the line around the edge is chased with a tool. The chasing tool is simply a cold

chisel ground to a short bevel and rounded somewhat like a fuller (as shown in Fig. 41). A short chisel is used for cold work and a longer one for hot work. The chasing can be done while the metal is cold. If it is to be very deep or wide the plate is heated and a longer chisel is used. The lug at Fig. 42 is made and riveted

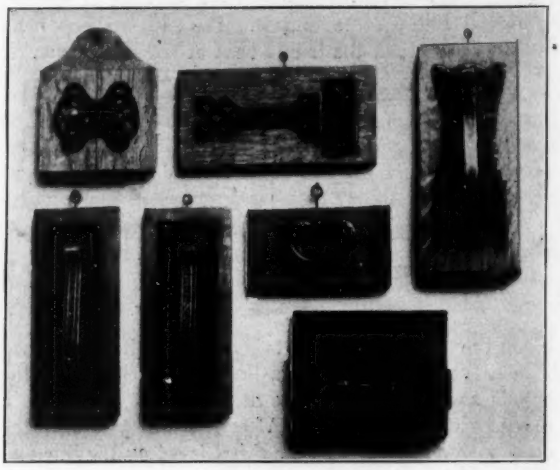


Fig. 39.

into the plate. The top of hammer is filed to straddle it. A hole is then drilled and a rivet put thru. Holes are drilled around the edge of the plate for screws or nails.

In making the hammer a piece of ¾ inch square, soft steel is used. It is upset on one end to get the stock

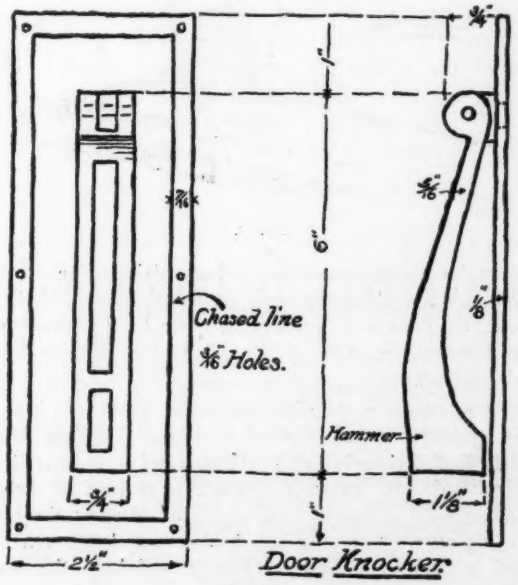


Fig. 40.

large enough for the bottom of the hammer. The bar is then drawn out on the horn as shown at Fig. 43. The top part is formed as shown at Fig. 44. Lines are chased on the front of hammer as shown in the drawing; this can be done after it is formed. If the lines are to be very deep it should be done while the piece is straight and heated.

There is ample room for design in the making of door knockers, both for the outside and inside of doors

Fig. 41.

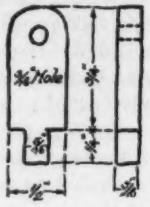


Fig. 42.

of dwellings. Knocker plates for doors on the inside of dwellings can be elaborated by a combination of repousse, chasing and perforated decoration which give a variety of light and shadow. Perforated plates can be backed

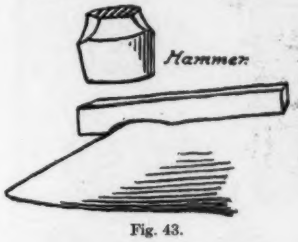


Fig. 43.

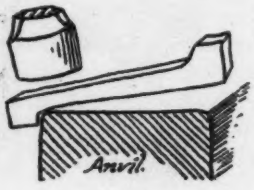


Fig. 44.

up with colored leather or cloth which gives a very pleasing contrast to the metal.

In Fig. 45 is shown an interior door knocker. It is backed up with colored leather. The plates are made

Fig. 45.

from ⅛ inch thick, soft steel. After the plates are cut out, the openings are marked with a slate pencil and gone over with a short cold chisel to mark them. The plate is then heated and the part enclosed by the chisel line is cut out. A very narrow chisel, 12 inches long, is used to do the cutting. The cutting is all done from the outside. This gives the edge a slight bevel. The edges of open places are trued up with a file. The openings must not be filed too exact and smooth. The most essential thing to look after is form; the work looks best when it shows handwork and is not mechanical. Handwork is most in keeping with the design and the material. The lines on the plate are chased with a narrow chisel and the foliated form bumped out from the back by

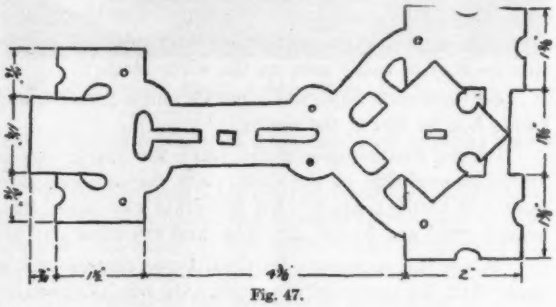


Fig. 47.

hammering on the end grain of the elm block. The hammer that does the knocking is hinged on the top plate so that the bottom part moves out and in when knocking. Very thin red leather is glued on the back of plates with fish glue. The diameter of the top plate

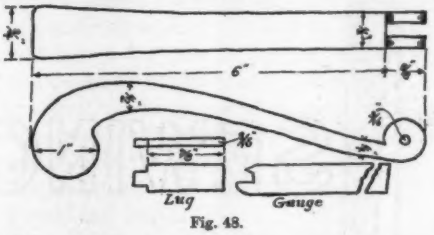


Fig. 48.

is 4½ inches, the bottom 2½ inches, and the hammer is 6¾ inches long.

A good method of working out ideas for things of this character is to make numerous rough sketches on paper with a lead pencil, making one line over another without erasing. When one gets what he thinks is good it is redrawn and perfected. It may then be worked in the material.

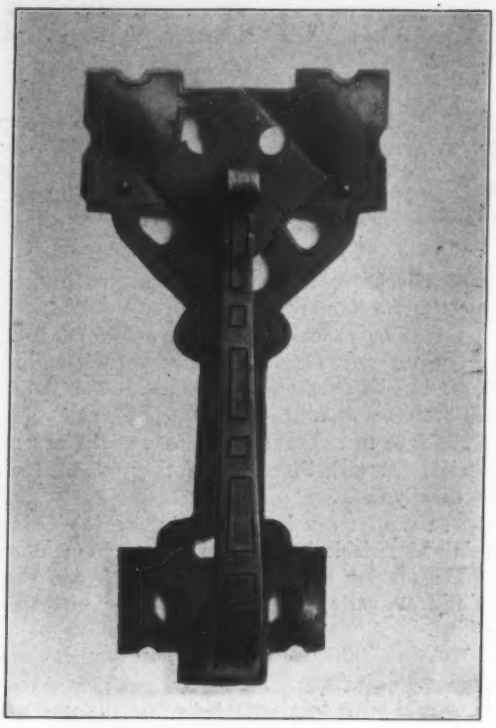


Fig. 46.

At Fig. 46 is shown a door knocker hinged at the top. The plate is one piece. At Fig. 47 are shown the dimensions of the plate. After the shape of the plate is sketched on the metal, the lines are traced with a chisel. The open work is then cut out and the outside of the plate is cut and filed. The center leaf at the top of the plate is indicated by forcing the metal down along the top edge of the leaf with a punch, also at the bottom to form the interlace. The plate should be hot when this is done. The hammer shown in Fig. 48 should be forged from ¾ inch, square soft steel. The lug shown on the drawing is to be made and riveted into the top of the plate. The hammer is then placed over the lug and the lug is drilled to conform to the drilled holes in the hammer.

The chasing on the plate and hammer is done with a chisel as previously explained. A gauge should be made from a piece of steel to scratch the guide lines on the plate for the chasing as shown in Fig. 48. These lines are then cut with the chisel.

THE wise workman will not regret the poverty or the solitude which brought out his working talents.

R. W. Emerson.

SEWING FOR THE GRADE SCHOOLS

Nellie M. Pairpoint, Director of Manual and Household Arts, Bristol, R. I.

SEWING is one of the manual subjects that is within the reach of every school in the country, both in cities and rural districts, and one of the most useful household arts that can be taught.

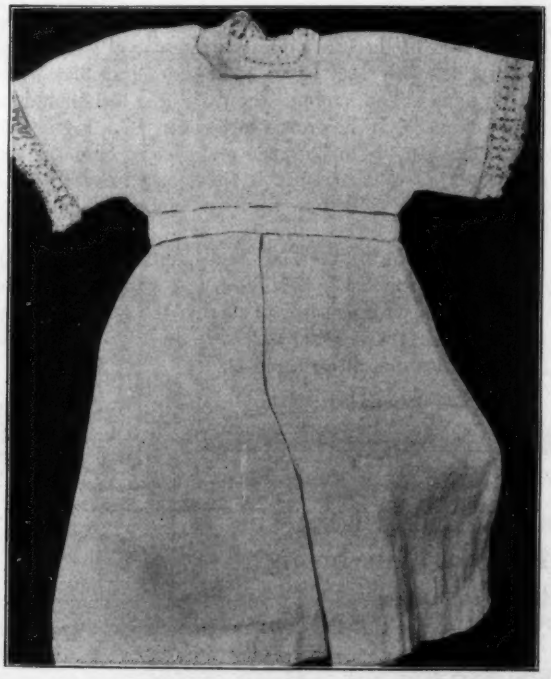
Each child should have her own thimble, to be kept at school. Thimbles are personal property, and to be most useful should fit their wearer.

The schools should supply some soft finished long cloth or cambric for the needlework books, so that stitches can be taught and work found for those who finish problems first.

Needles, thread, and pins are a slight expense, if the schools furnish them; and if they do not, the children usually can.

The subject can be divided into: (a) Using the needle and thimble, and the simple stitches and seams; (b) The making of plain garments by hand; (c) The cutting from patterns, fitting, and the use of the sewing machine.

Children of the fourth and fifth grades are old enough to begin the work, and in these grades the children should learn to use the tools, and to make some of the simple stitches. During the sixth year, they should learn to put a simple garment together, that has been cut out for them. In the seventh year, girls can be taught to use a sewing machine, and cut a garment from a commercial pattern; and in the eighth grade they should learn to fit simple things such as slips and house dresses.



A Doll Dress Made by Sixth Grade Girls.

When sewing has been taught in the previous grades the pupils can easily make simple graduation dresses in the eighth grade. When a girl has had this foundation in the grade schools, she is ready to intelligently take up dressmaking and millinery in the high schools.

For the needlework books, pieces of soft finished cloth nine inches square, will be found suitable, and a yard of cloth 36 inches wide, will cut into sixteen pieces.

Have the cloth cut into the squares before the lesson. If the school furnishes the thread each room should have one spool for each row of desks. For the needlework books, use pink, red, or blue thread, so that the stitches may be easily seen on the white cloth.

See that each pupil has a needle and a thimble, and knows how to thread the needle.

On the first samples made, teach the pupils how to overhand one edge of the cloth. On the opposite side, teach the blanket stitch. On the other two sides, have hems turned and basted, one wide and the other narrow.

When the edges are finished, three creases can be made thru the center of the cloth. On one the running stitch is to be made, on the second the combination stitch, and on the third the back stitch. When finished the piece of cloth can be pasted to a sheet of gray drawing paper, and when the samplers are complete, they

Fig. 1. Loose Leaf Needle Work Book.

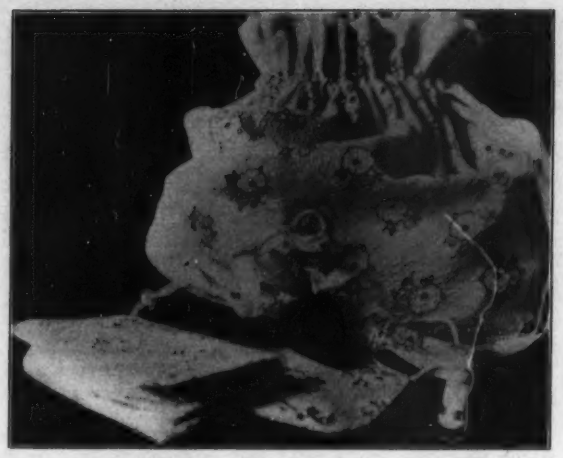


Fig. 2. A Sewing Outfit.

may be bound together in a looseleaf book cover as shown in Figure 1.

With this knowledge each girl can make her sewing outfit. The needlebook can be made from scraps of cloth brought from home, or a yard and a half of material will make the complete outfit, and it will then be all alike.

The leaves of the needlebook should be of domet flannel, and the edges of both leaves and cover can be finished with the blanket stitch, and the book sewn together with the combination stitch.

A pin ball is also most useful for each girl to have. Cut two cardboard circles, gather pieces of cloth over them, and buttonhole the edges together.

When made these should be kept in school, and each girl should have a few pins in her pin ball, an ordinary sewing needle, and a crewel needle in her needle book.

The crewel needle is useful in using silkateen for edges of the needlebook leaves, and also for darning.

A bag to hold the sewing tools and work should be made next, and kept at school. The bag may be made with the overhand seams.

When a sewing lesson is to be given, have the bags distributed, and each girl will at once be ready to begin work.

These bags and their equipment, when made in the fourth or fifth grade, can be passed along as the pupils go from room to room. Such a sewing outfit is illustrated in Figure 2.

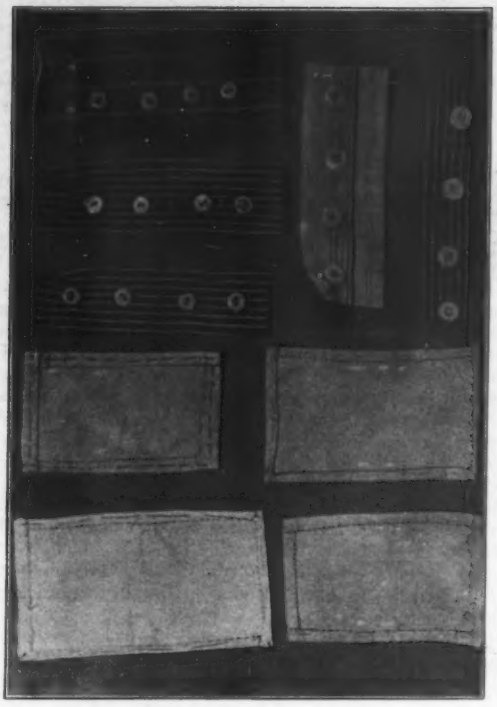
If there is any extra time after the sewing equipment is made in these grades, it is well for the pupils to learn how to sew on buttons, darn stockings, put on plain patches, make an apron and a flannel petticoat.

The sixth year is an excellent time to make a cap, sleeves, and long apron to be used when cooking, either at school or at home.

Before each new problem is taken up, have as many sheets as are necessary worked out for the needlework book.

In connection with the apron, at least two seams can be taught, and the felled and French seams will be found the most useful.

In the seventh year have an iron-holder made, and



A Page of a Needle Work Book.

stitched on the sewing machine, around the edge, and thru the center diagonally from each corner.

If there are no sewing machines at school, have the work cut and basted there, and stitched at home.

Have the children learn how to thread the machine, oil it, and treadle evenly, and how the tension of the threads is controlled.

As a second machine exercise, have the pupils make a laundry bag. Have them stitch the French seams on each side, and the hem at the top, and stitch on a strip of cloth to hold the draw strings. Cretonne or ramie linen is excellent material for this bag.

For the use of paper patterns in the seventh grade, a white petticoat and kimono night dress are excellent subjects, and a dressing sacque can be added if there is time.

When the pupils have completed the eighth grade, their needlework books should contain sheets showing basting, running, overhanding, combination, and back stitches, and plain hemming. In the more advanced work, there should be sheets showing how to make a felled seam, French seam, flannel seam, one or two ways of putting on a ruffle, putting on a band, setting tucks, French hemming for table linen, and hemstitching. For use in garment making, a skirt placket, opening of night dress, opening of sleeve; and among the fastenings, buttons and buttonholes, eyelets, blind loops, hooks and eyes.

These exercises should be worked out on the nine-inch squares of cloth, and bound into book form, and can be carried along from room to room, and added to each year, until each child has the complete course to take home.

ELEMENTARY MECHANISMS

Ray F. Kuns, Cincinnati, O.

(Fifth Article)

Horizontal Steam Engine.

IT has been stated that from 100 to 150 hours were required by the average eighth-grade boy for the completion of one of these engines. This fact will likely preclude it as a possibility in many schools, but there are many others in which sufficient time is available in the eighth grade. It is to these, and to the small high school which cannot afford a machineshop equipment, that this model should particularly commend itself. However, it most assuredly is not presented as a machineshop problem. In fact, no machinery of any nature is necessary to its completion altho a band saw, speed lathe, and drill press, if available, will be found of material aid in its construction. With careful buying the entire cost of this model need not exceed one dollar. One boy refused ten dollars for his as he was carrying it home. The stated speed of 375 R. P. M. is conservative inasmuch as these engines have tested as high as 760 R. P. M. Construction of one of these engines involves many of the underlying principles of the patternmaker's, founder's and machinist's trades.

Time will be saved if all wood parts are worked out before starting on the metal work.

Wood Parts.

Base. Use any sound wood. Hard wood is perhaps the best, but clear grained soft wood is more easily worked

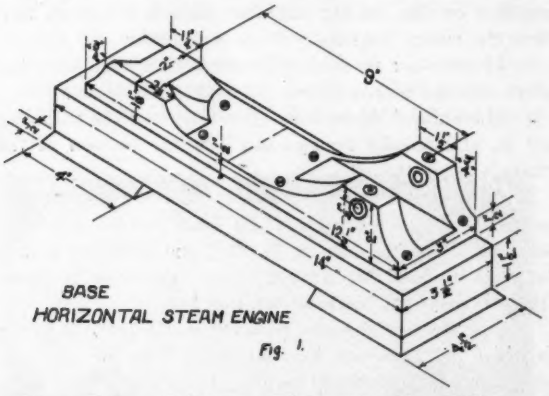


Fig. 1.

and is entirely satisfactory. The construction of this part is clearly shown except, perhaps, the preparation of the places for babbitting the bearings. In doing this a $\frac{5}{8}$" bit is used to bore thru the bearing supports from the sides. Be certain to have the center of the hole where the center of the shaft is to come. With the $\frac{3}{4}$" bit next bore a hole from the top of the bearing support down thru the $\frac{5}{8}$" hole and on thru this part of the base. This arrangement prevents the babbitt from loosening and turning in the support and serves as a re-enforcement for that part. The feet of the base are held in position by means of brads, while screws are used for the top part.

After the base has been carefully sanded, it should be painted or enameled. Several coats will likely be necessary for a good even finish and each one should be rubbed down before the following one is applied. After the last coat of paint has been applied, the base may be striped if desired and a coat of clear varnish applied.

This completes the base except the exhaust and the bearings, and these are left until a later time.

Molds. In making all molds, care must be used to secure the proper shape and size as well as good close-fitting parts. It is not what the outside looks like, but rather what the inside is, that makes perfect castings. Use some clear close-grained wood for all molds. Mahogany is an ideal wood altho white pine, poplar, spruce or maple will work almost equally well. Do not use an open-grained wood, as the hot metal will run into the pores, sticking to the mold and forming an uneven casting. Sometimes even when using seasoned woods, bubbles will form causing uneven castings. This may be avoided, to a large degree, by lining the molds with gummed paper. This is not necessary, when the molds have an open face, which may be rested on a piece of paper when pouring. A smooth mold insures a smooth casting.

Mold for Steam Chest and Cylinder Casting. This is the most important mold and is shown in Figure 2. In addition to the parts shown four boards of $\frac{1}{4}$" material, just large enough to cover the faces having the openings in them, are needed. One face of each of these should be covered with heavy cardboard.

In working up this mold first get parts to the correct outside dimensions and pin together. Next lay off the center of the holes C and D on the line X which is formed by the two sections of the mold joining. With the extension bit, set to cut a hole exactly 2" in diameter, bore hole

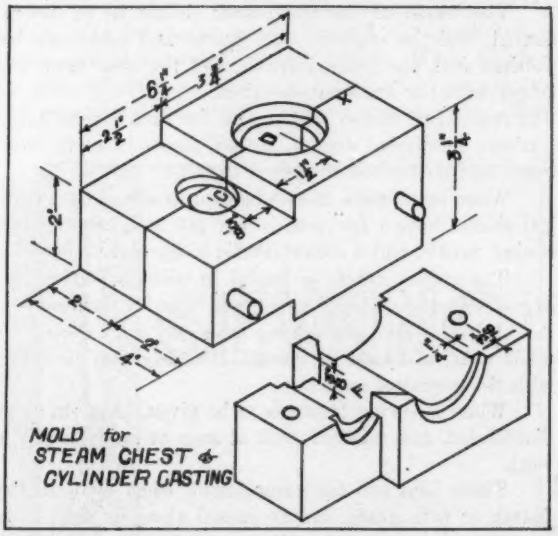


Fig. 2.

D until the nib of the bit has cut 3-16" deep. Change bit to $1\frac{1}{4}$" and with the spur of the bit on the same center, bore to the center of the mold.

Set extension bit for hole $1\frac{1}{4}$" in diameter and bore hole C, 3-16" deep. With the $\frac{3}{4}$" bit set in the center of this hole, bore to the center of the mold. Since the opposite faces of the mold are just the same as these, time will be saved by laying off and working all up together. Be careful to have the holes meet in the center of the mold, as they are to hold the tubing used for the steam chest and cylinder, and unless they form a snug fit, the metal will run around them when the casting is made, thereby forming an unsightly casting.

With these holes bored the mold is removed from the vise and taken apart. Next gauge a line 3-16" in from the end of each hole, all the way around. Remove the wood from the end in to this line, in each case allowing this cut to meet the one made by the nib of the extension

bit in boring the 1¼" and 2" holes. This arrangement forms a square corner or rabbet in which the metal will run when the casting is made, thus forming the flanges to which the steam chest and cylinder heads are bolted.

With a sharp chisel next remove the wood between the holes in each section to the depth of ⅜". This is shown at F in the drawing. In this manner allowance is made for the body of the casting which is just ¼" thick and contains the ports and exhaust. See that the mold is arranged for clearance at every point.

Molds for Slide Valve and Piston Head. These are shown in Figure 3. These castings must be made after the tubing has been cut to length for the steam chest and cylinder, and before the holes for the ports and exhaust

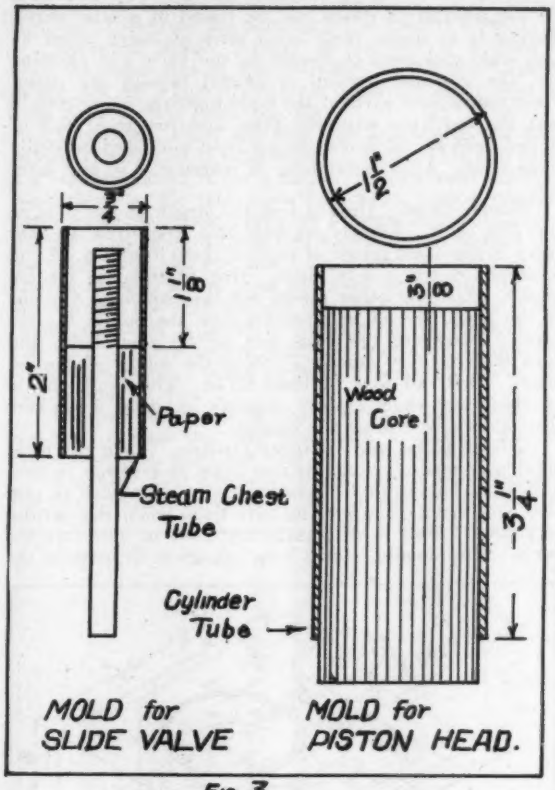


Fig. 3

have been cut in. All burs must be removed from the inside of the tubes. Turn out the wood core for the cylinder tube on the lathe, if one is at hand; otherwise, select the best piece of cylindrical wood available, and wrap paper on it to bring it to the required size.

In the mold for the slide valve, paper strips are wrapped around the slide valve rod to center it in the tube.

Directions for getting out these metal parts will be found under the head of metal parts.

Molds for Steam Chest and Cylinder Heads. The drawing, Figure 4, makes the construction of these plain. In case a lathe is not available for this work, it may be done by means of the extension bit, auger bits, gouges and chisels. In any case the holes for pouring the back heads will want to be bored.

Mold for Eccentric. This is shown in Figure 5. The large hole, which should just take the eccentric ring, is made ⅛" deeper than the ring is wide. This allows for the flange on the finished casting which serves to keep the ring in position on the back, while a washer holds it on from the other side. The ¼" hole forms a re-enforcement for the main part of the casting, as well as affording a place for pinning the finished casting to the shaft. The one ⅜" hole is for pouring while the other is for the shaft, which is held in the mold while the casting is being poured, thus securing the necessary hole in the casting.

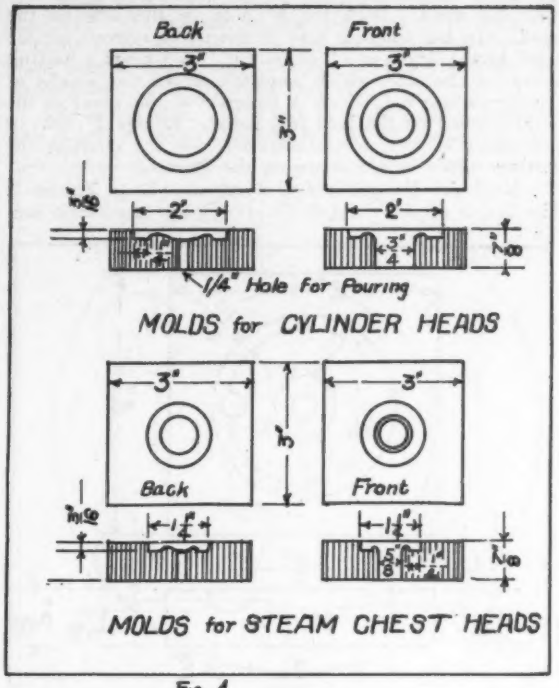


Fig. 4

By far the most important point in the construction of this mold is boring the ⅜" hole just 3-16" off the center of the large one. This will give the necessary ⅜" throw to the slide valve. To prevent the spur of the bit from slipping into the hole made by the spur of the other bit, it should be plugged with a bit of wood. In every case, place the spur of the bit being used on the line formed by the juncture of the two sections of the mold.

Crank Wheel Mold. This may be made on the lathe or by means of the extension bit and chisels. First cut the ¼" rim ¼" deep. Cut the center ⅛" wide and ⅜" deep. Remove the wood left between these cuts to the depth of ⅛". Next bore a ⅜" hole in the center of the ⅛" hole, on

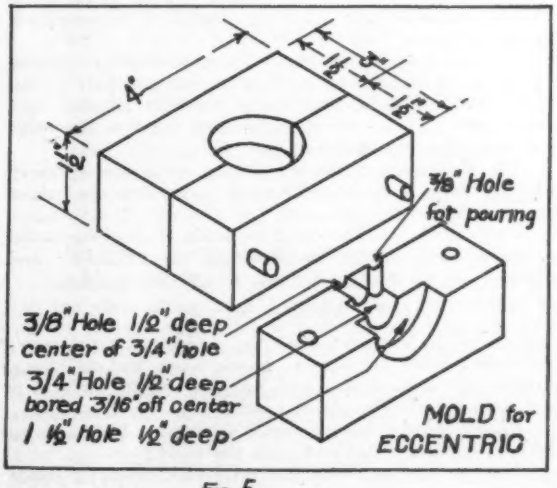

3/8" Hole for pouring
3/8" Hole 1/2" deep center of 3/4" hole
3/4" Hole 1/2" deep bored 3/16" off center
1 1/2" Hole 1/2" deep
MOLD for ECCENTRIC

Fig. 5.

thru the mold. Bore the ⅜" hole in the side of the mold. On the opposite side of the mold, remove all the wood to the depth of ¼" as shown. This gives a casting heavy on one side, which counterbalances the weight of the connecting rod, which is fastened to the wheel at the point formed by the hole just bored. Bore a ⅜" hole in the center of the counterbalanced side for pouring the casting. This is not shown on the drawing.

Mold for Eccentric Rod Fastener. Note Figure 7. The inside of the mold is as always the important con-

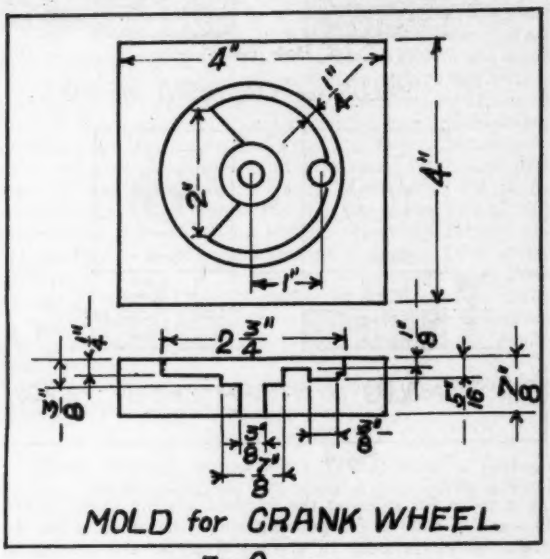


Fig. 6.

sideration. Be certain to provide sufficient clearance for the casting.

Mold for Connecting Rod End. Note Figure 8. The ⅜" hole is bored 1-16" deeper than the other part of the mold to prevent the finished casting's rubbing on the wheel as it turns. Iron is used in the molds shown in Figures 7 and 8 as brass is hardly strong enough to stand the strain of being turned out after the casting has been made.

Fly Wheel. Shown in Figure 9. This form of wheel is the one ordinarily used. It is first worked out round, then has the holes laid off, bored and run full of melted metal, after which it is chucked on the lathe and turned. It can, however, be worked out by hand, if no lathe is available, and after the engine is in operation turned up true.

All metal wheels are made from babbitt by turning out the mold in two boards, half in one and half in the other. These wheels after being cast are chucked and turned true. This form of wheel adds much to the valve as well as the appearance of the engine.

The fly wheels from old sewing machines are very good for these engines and are of just about the proper weight and size.

Pulley Wheel. This may be made from either wood or metal and should be about 1½" in diameter and arranged for a round or flat belt to suit the builder.

Metal Parts.

Cylinder. This is made from a piece of 1-16" seamless drawn brass tubing 1½" in diameter and 3¼" long. Having cut it to length and squared up the ends it is next used to cast the piston head.

Piston Head. Arrange mold as shown. Melt a cheap grade of babbitt metal and pour the mold full.

Remove casting from the mold and carefully locate its center. Counterpunch and drill a 5-16" hole at this point. Next cut a groove in the edge of the casting ⅛" wide and 3-16" deep. This may be done on the lathe or by means of a file.

Cylinder. With the piston head cast, holes for the ports may next be drilled in the cylinder tubing. There are two of these with their centers ⅜" from the ends. After these holes have been drilled thru, the tubing is slowly twisted on the turning drill bit until the hole is cut thru on an angle of about 45° as shown on the section.

Steam Chest. A piece of 1-16" seamless drawn brass tubing ⅜" by 2" long is required for this. After cutting to length and squaring up the ends, the burs should be removed from the inside of it. The slide valve must next be cast.

Slide Valve. Work out the slide valve rod, directions for the making of which will be found at a later point. Having it to shape, next cut a strip of heavy paper an inch wide and wrap it closely on the valve rod allowing just the threaded portion to extend beyond the paper. Place the various parts of the mold together, being certain that the rod lines with the tube, and run mold full of melted babbitt. Remove casting from mold and carefully place away. Avoid scratching or marring it in any manner.

Steam Chest. Draw a line the length of the tube on one side of it. Exactly opposite this line, draw another one. In the exact center of each of these lines, lay off and centerpunch for a 3-16" hole. One of these is for the intake, while the other serves for the exhaust. On one of the lines, lay off and centerpunch the points for the ports. These are the same size as the other holes and have their centers exactly ⅜" from the center of the exhaust. Drill all four of these holes. This work should be absolutely exact. More depends on good work here than anywhere else on the engine.

Steam Chest and Cylinder Casting. Take the mold previously made, laying the two tubes in position in one-half of it, having first placed a wood core in each to prevent any metal from getting into them when the casting is poured. Two 3-16" dowels are used to core out the ports. They should be just long enough to fit between the

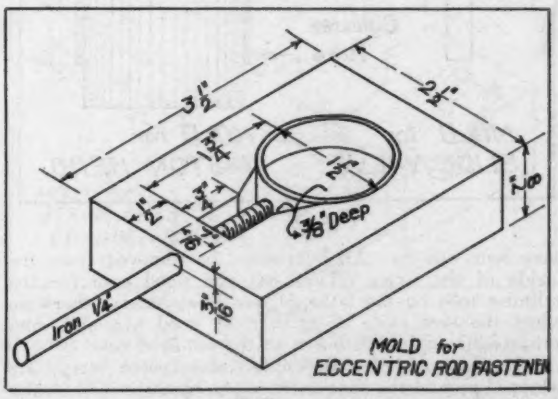


Fig. 7

cores in the tube when the others are in position in the mold. Place on the other half of the mold, seeing that all parts assemble properly.

Next remove the tubes from the mold and carefully clean all parts of them which will come in contact with the melted metal when casting is poured. Clean with sandpaper and treat these parts with soldering salts. Quickly reassemble mold, clamping it together with C clamps. Clamp on the boards previously prepared to cover the ends of the tubes. Allow the board covering one end of the cylinder to come away from the center of the mold far enough to permit of pouring.

As the tubes must come from the mold as part of the solid casting, solder is used to join them together, and

to form the flanges for bolting the steam chest and cylinder head to. Heat the solder considerably above the melting point but not to a red heat. See that all joints are tight, and run the casting.

Remove from the mold after allowing plenty of time for it to cool. Inspect the flanges to learn if they are really soldered fast. A light blow from a hammer will displace them, if they are not. In this case replace casting in mold, and clamp it together, but do not clamp on the boards. Treat the loose places with soldering salts, and work the solder with a soldering iron. This will usually fix the trouble, and there is seldom need for making another casting.

Cylinder and Steam Chest Heads. Clamp these molds open face down on the band-saw table or other even surface, having a piece of paper under them. Run castings thru holes prepared for pouring. Use babbitt metal.

Eccentric Ring. Square up one end of a piece of pipe the same size as the cylinder. With the marking gauge, lay off a line on it $\frac{3}{8}$" in from the end. Saw off and work to line with the file.

Eccentric. Place the ring just finished in the mold having the edge of it flush with the face. This will allow a $\frac{1}{4}$" space back of it for a flange. Clamp mold together. Next place on the table open face down, with a piece of paper under it. Place a piece of $\frac{3}{8}$" brass in the mold from the top. The piece of brass rod, which is later worked into the shaft, will do for this. To insure the hole in the casting being true the brass rod must be squared up. To do this first see that the rod lines with the blade of the try square when it is set in position on the table at one side of it. Move square $\frac{1}{4}$ of the way around and test from that point. When it lines from each point, the casting may be run.

Remove casting from the mold and ring from the casting. Scrape the ring seat with a chisel, knife or cabinet scraper, until the ring will turn easily on it.

Eccentric Rod Fastener. Place ring in mold prepared for this. Place a piece of $\frac{1}{4}$" iron or steel in the mold as

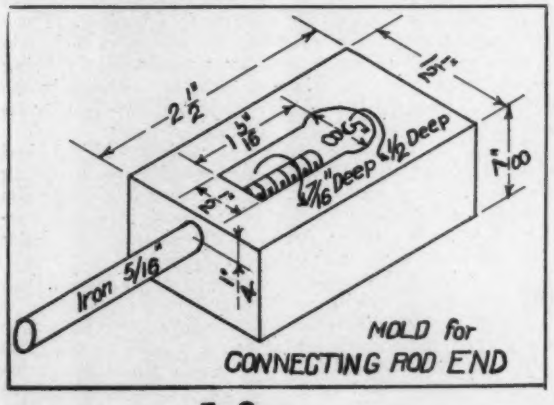


Fig. 8.

shown having at least 1" of thread cut on the end. These threads should either be smoked or dusted freely with chalk dust to prevent the metal's sticking to them. Treat the portion of the ring coming in contact with the metal with soldering salts, or better yet, tin it. Instead of melting the solder in a ladle and pouring while hot, a better method in this case is to heat the soldering iron and melt the solder directly from the bar into the mold, working it until it forms a perfect union with the ring.

Place the iron stem in the vise, and with a wrench on the mold the stem may be turned out. Remove from the mold and smooth up with the file.

Connecting Rod End. Assemble mold carefully, and run with good hot babbitt metal being careful to prepare the threads to prevent their sticking.

Slide Valve Rod. Note section for size, shape and position. The tongue on the end of it is $\frac{1}{2}$" long. In cutting threads on it, it is best to hold it between two hard wood blocks in order not to mar it in any way. The threads are cut on for a distance of $\frac{3}{4}$".

Eccentric Rod. This, too, is made from $\frac{1}{4}$" brass rod and is just 6" long. One end has $1\frac{1}{2}$" of thread run on it,

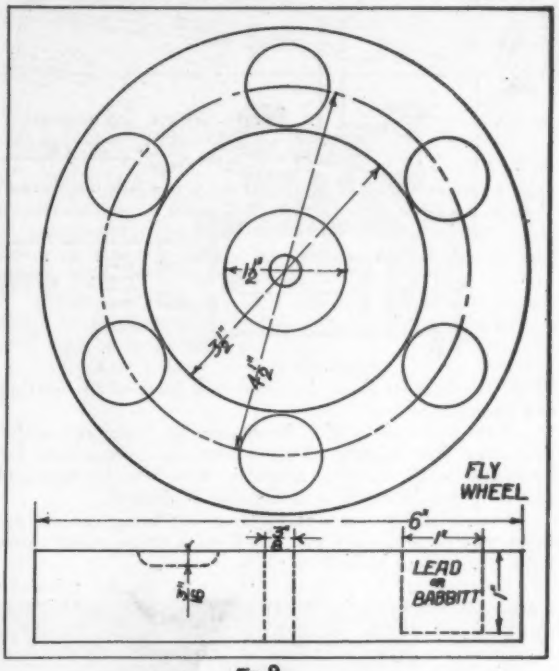


Fig. 9.

while the other end is split in the center for a distance of $\frac{3}{4}$". This end is then worked to the shape shown, and the two parts are fastened together by means of a $\frac{1}{4}$" by $\frac{1}{2}$" R. H. stove bolt.

Piston Rod. The shape and size of this can be noted on the drawing. Brass rod is used. Just enough threads are cut on the one end to take the two nuts and the piston head. The tongue on the other end is $\frac{1}{2}$" long.

Connecting Rod. The size of this is shown on drawing as well as its shape. The threads are $1\frac{1}{2}$" long and the other end is split with the hack saw for $\frac{3}{4}$" and bent to the shape shown. These parts are joined with a $\frac{1}{4}$" by $\frac{1}{2}$" R. H. stove bolt.

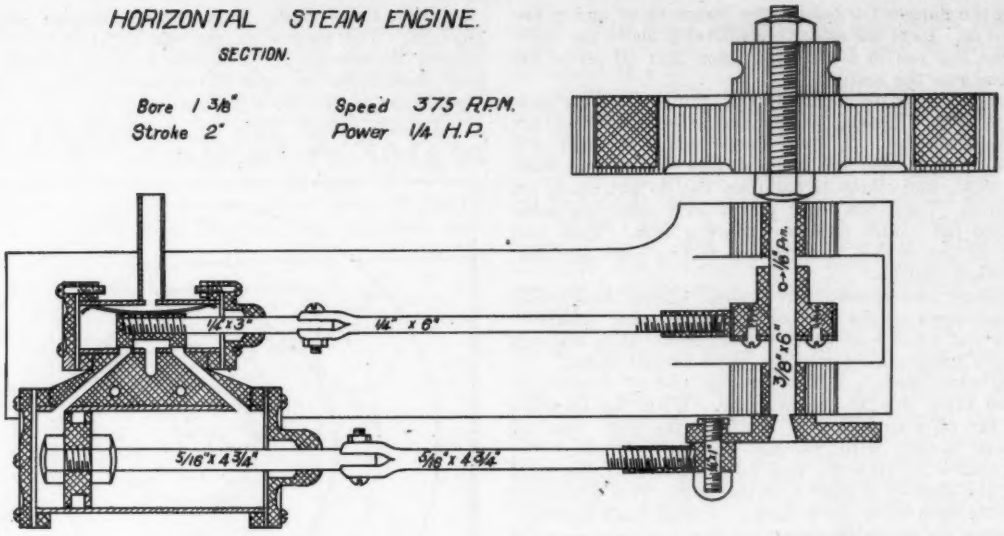
Shaft. Use $\frac{3}{8}$" brass rod for this and work out as shown in the section. Be very careful not to mar it in any way, and remove any burs left by the die in cutting the threads, otherwise the bearings will be spoiled in taking it out and replacing.

Crank Wheel. Having the shaft finished, the mold for the crank wheel may be placed face down on the table with a piece of paper under it. Clamp it in position, and square up the shaft in it. Run the casting using babbitt metal.

Working Up Castings and Assembling Parts.

Steam Chest and Cylinder Casting. Carefully bore out the ports using a 3-16" twist bit and boring thru the end of the cylinder. Allow just the point of the bit to come thru into the steam chest. Finish cleaning out the ports using a wire or small file.

Drill down thru the intake and exhaust holes in the steam chest and on into the casting 5-16". From one side of the casting, drill a hole to meet this one, using the 3-16" bit for all of this work. The side containing the hole just drilled is the one which will rest on the base.



With this hole in place the front and back of the casting are determined.

Next cut a piece of $\frac{3}{8}$" brass pipe $1\frac{1}{2}$" long, and solder this over the intake. This forms the connection for attaching to the boiler. A small valve may be arranged at this point to serve as a throttle if desired.

Square up the ends of the castings being sure to get them true or the heads will not form a steam tight union with them when bolted in place.

Remove all burs from the inside of the tubes by means of the small half-round file or a piece of emery cloth or sandpaper on a dowell.

Steam Chest and Cylinder Heads. Smooth these up with the scraper and file. In the center of the front steam chest head, drill a $\frac{1}{4}$" hole. From the inside of the casting, drill half way back thru the hole just finished using the 7-16" bit.

Drill a 5-16" hole in the center of the front cylinder head. From the inside of this, drill half way back with the $\frac{1}{4}$" bit. The enlarged parts of these holes form the stuffing boxes.

Piston Head. Assemble this on the piston rod using locked nuts to hold it in position. These must be turned quite tight to prevent their coming loose when the engine is placed in operation.

Place piston in cylinder and the front head in place. When these parts are in a position that the piston rod lines with the cylinder as it passes in and out, the head may be bolted in place. Use six $\frac{1}{8}$" by $\frac{1}{4}$" R. H. stove bolts for this, seeing that they are equidistant from each other, and well placed.

Fasten on back head in same manner.

Slide Valve. Take casting previously made for this, and square up each end until it measures just 1" long, or just long enough to cover both ports at the same time. Next cut off one side of the casting to the depth of $\frac{1}{8}$". This may be done with the saw and file or the block plane may be used. Do not clamp this in the vise, while working it up, as it is certain to ruin it. The valve stem may be held in the vise if the jaws are wood lined and reasonable care is used. Having the back of the slide valve worked up, the casting may be laid on the table on this flat side and the front of it modeled. The shape of this is shown in the section. The cut on this side is the same depth as the other, however $\frac{1}{4}$" is left standing at each end. These are the parts of the valve which cover the ports when the engine is on dead center. A flat spring $\frac{1}{4}$" by 2" is placed on the back of the slide valve to hold it tight against the ports.

Assemble heads on the steam chest in the same manner suggested for the cylinder heads. Three of the stove bolts are used in fastening each one in place.

Fastening to Base. Drill two 3-16" holes in the casting as shown in the section being careful to miss the ports, exhaust and tubes. Locate the point on the base which the hole for the exhaust covers. Bore a $\frac{3}{8}$" hole into the base at this point. From a point directly under the intake, and in the center of the top part of the base, drill another hole in to meet this one. Fit some of the $\frac{3}{8}$" pipe into each of these holes allowing the end of the one to extend an inch beyond the base of the engine. A mitered joint will have to be used where they meet in the base. The casting is held to the base by means of two screws or bolts.

Babbitting Bearings. Prepare four pieces of thin board with a $\frac{3}{8}$" hole in the center of each piece. Place the shaft in position with one of the pieces on each side of each bearing support. Tack these pieces lightly, being certain to have the shaft in the center of the holes in the supports. Run the bearings pouring thru the hole in the top of the support.

Place on wheel, fastening in position with locked nuts. Loosen shaft by driving on it lightly and turning the wheel. Next remove wheel, and after inspecting the threaded end for any burs which might injure the bearings, the shaft may be removed. Drill two 3-16" holes into the bearing from the top for oil holes.

Eccentric. Assemble this first placing on the ring. Cut a brass disc $1\frac{1}{2}$" in diameter and drill a $\frac{3}{8}$" hole in it 3-16" off center. Fasten this on the eccentric by means of two $\frac{3}{4}$" wood screws, seeing that the holes in the parts coincide. Drill 3-16" holes in the disc and $\frac{1}{8}$" holes in the casting for the screws. Place eccentric in position and replace shaft in bearings having the eccentric in position on it. Turn eccentric rod into place bolting to slide valve rod.

Connecting Rod. The method of assembling this and the style of wrist pin used is shown in the section. The nut on the back will have to be rather thin to prevent its striking the base when the wheel turns. Bolt the connecting rod to the piston rod.

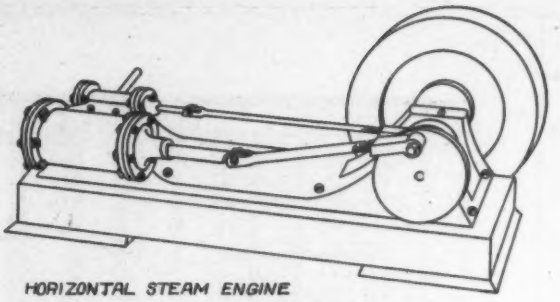
Pinning Eccentric. In order that the engine run smoothly, the eccentric must lead the connecting rod by just $\frac{1}{4}$ turn. Get this as follows: Place crank wheel in position shown in section. A small ridge is left on the eccentric casting by the joint in the mold. This line or ridge should stand vertical with the large side of the eccentric over the shaft. With these parts hold in this position, a $\frac{1}{8}$" hole may be drilled thru the small part of the eccentric and the center of the shaft. A pin or stove bolt will keep it in position.

Inspection. With all parts of the engine in position, they may be gone over very carefully to see if all adjustments are correct, especially that of the slide valve and piston head. If these do not have their correct positions, they may be adjusted by means of the threads on the eccentric and connecting rods. The engine may now be placed on the block and run for a time after which, if all is working well it may be taken apart and packed.

The piston head is packed with cotton waste or soft yarn. Be sure all sides fill out evenly. The stuffing boxes are packed with the same material. Pack loosely around rods using plenty of heavy oil. A piece of tough pasteboard is next prepared and placed between each of the heads and the flanges. This should be well oiled. To keep the packing in the stuffing boxes, cut small pieces of tin slightly smaller than the tubes. In the center of each, drill the proper size hole and insert this between the cardboard and the head.

Failure to Operate. This may be due to a variety of causes but the most usual one is a poor slide valve or bad adjustment.

If after the engine has been carefully packed and reassembled and tested with steam, it refuses to run, look first for friction and poor adjustments. If the slide valve should be found to be leaking, it may be remedied by removing valve and scraping where it shows wear. Under no circumstances use a file on it. If it still leaks, it may be reseated by removing the connecting rod and back steam chest head. Place on block and work in oil and emery; dust while engine is in motion.



Outline of Engine.

Throttle. This may be a valve in the rubber tubing which is usually used to connect this engine to the boiler, or it may be soldered to the intake.

Boilers have been treated elsewhere.

Jewelry made by Students in the Home Economics Department, Metal Work Classes, Oregon Agricultural College, Corvallis, Oregon.

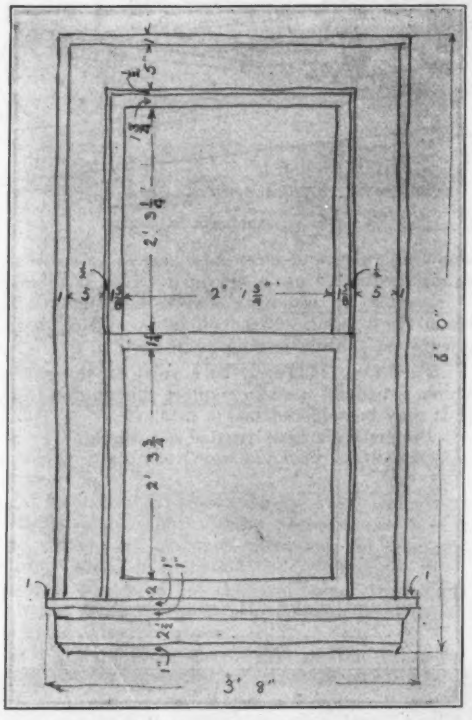


Fig. 1. Free Hand, Dimensioned Sketch of Window; Measurement to be Taken by Student from Actual Window at Home.

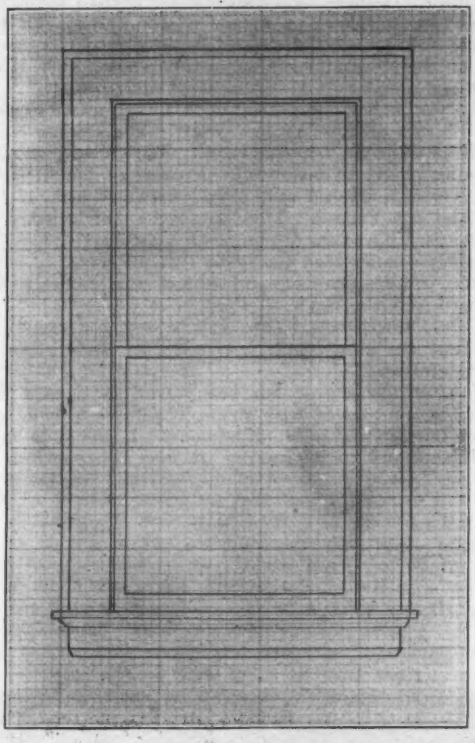


Fig. 2. The Sketch Drawn Again to Scale on Squared Paper, Twelve Divisions to the Inch.

PROBLEMS IN DESIGN

Bonnie E. Snow, Millburn, N. J.

(Lesson X)

THE Principles of Art Applied in Practical Problems: "Houses are curious things. They are among the most intimate of our possessions. We warm them with our fires, we animate them with our affections, we furnish them with such things as seem good to our eyes and fitting for our comfort. They represent our personality; they become alive, as it were, for we infuse into them something of our own being.

"Yet it is seldom the large, elaborate house that holds this intimate home spirit. Think of the mansions occupied only a few months "in the season." Think how dreary and lonely are most of the great houses you know. They seem pervaded with the spirit of unrest. Their owners are constantly traveling from one place to another, ridden to exhaustion by the care of many possessions. They are haunted by the desire to own more things than their souls can grasp and their personalities can vitalize.

"For there is a limitation to our capacity for appropriating and assimilating material things. Mere ownership is not possession. The only houses which have real meaning and beauty are the ones into which the owner has toilsomely yet lovingly worked a part of himself."

So writes Gustav Stickley, the craftsman; the man who has given to America the sanest, sincerest, most dignified and lasting scheme of home building and home furnishing that our country has known. Thru the many influences that flow from various phases of his work, he is contributing perhaps more than any other person or group of persons toward the establishment of a national type, an American "period" of building and decoration.

There is no human being without some ideal of beauty, however far below the established standard this ideal may fall. Everyone enjoys what is to him beautiful. The more one feeds his craving for beauty on what is sincere, real and significant, the more will develop one's ability to appreciate what is good. In the schools we are seeking to elevate standards of taste by presenting art study in a new light; not as representation, or picture-making, but as the expression of man's joy in

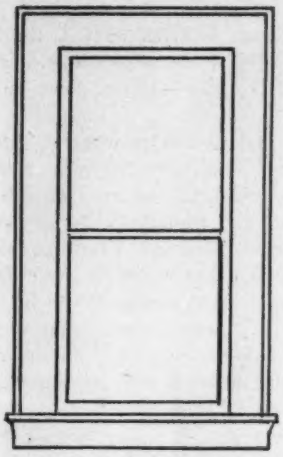


Fig. 3. The Sketch (Fig. 2) Transferred by Tracing to White Drawing Paper and Lined in with Ink or Pencil.

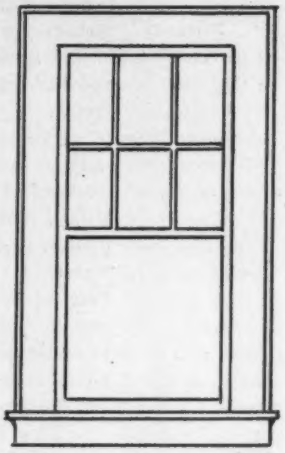


Fig. 4. Another Tracing of the Same Window Showing a More Interesting Spacing of the Upper Sash.

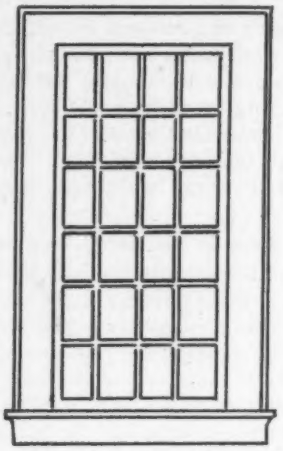


Fig. 5. Still another Arrangement of Spaces of the Same Window Frame (See Fig. 3).

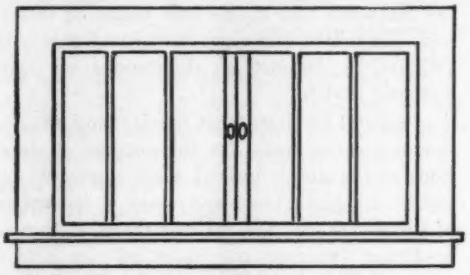


Fig. 6. One way of Spacing a Horizontal Window Space.

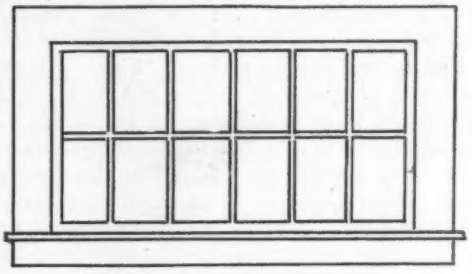


Fig. 7. Another Variation of Spacing.

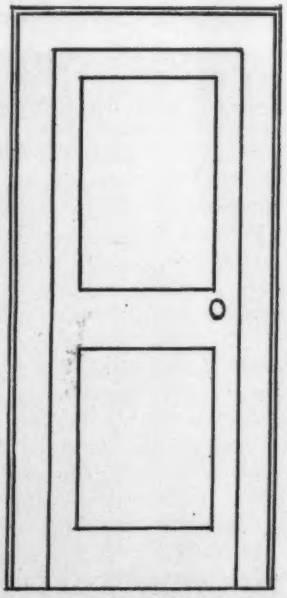


Fig. 8. A Conventional Door Drawn from Measurements taken from "Reality."

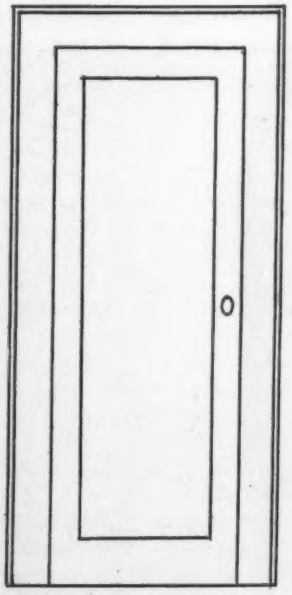


Fig. 9. A Door of Greater Distinction Because More Beautifully Spaced.

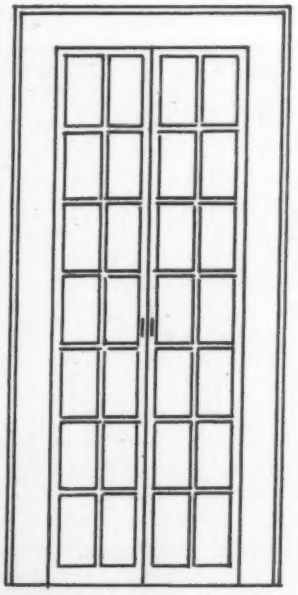


Fig. 10. The Style of Doorway Known as the French Window.

his work. This expression may be in terms of wood and concrete; it may be by means of the needle and cloth; in forms of metal; in shapes of glass; in arrangements of spaces on a wall; in furniture and furnishings; yes, and in cooking and common household labor. "Beauty must come back to the useful arts, and the distinction between the fine and the useful arts must be forgotten." We are seeking to establish the study of art upon the basis of an understanding of order, rhythm, balance and harmony, so that any work from man's hand may be estimated and judged in the light of obedience to these principles.

First Steps in Interior Decoration. Very near to the lives of the students in high-school classes is the subject of home furnishing and decoration. A simple beginning, which will give us an opportunity to further illustrate and to apply the principle of balance, may be made in the problem which follows. Require the students to measure an ordinary window at home, setting down all measurements, such as the height and width of the entire window space, the width of the frame, the width of the moldings, the size of the panes, etc. As simple a type as possible should be selected, until the students are accustomed to the work. A freehand, dimensioned sketch should be made at home, and brought to school as the basis of the problem. Figure 1 shows one result. A window 6′ in height and 3′ 8″ in its greatest width of frame was chosen for the sketch. It was an ordinary window in a bedroom, and its framework was not as severely plain as is desirable for this first work. But its type is far more common than a simpler, plainer style; for this reason—because it was the type of window that nine-tenths of our students find at home—it was selected. In these first steps, it is assumed that the students know how to read and make a simple working drawing; that they can measure accurately, and make a simple drawing "to scale." In the sketch (Figure 1) the widths of the moldings are indicated by little arrow heads and figures, placed on or near the dimension indicated. The side width of the frame, including moldings, is given (6½″), the bottom width of the frame (3½″), the different widths of the sash, and the size of the glass—all set down on the freehand sketch.

The next step is the drawing of the sketch upon squared paper. This may be done with no further mechanical aid than the squared paper and a ruler, altho a T-square and triangle "come in handy." In the present problem, a division of twelve squares to the inch was used. This makes a simple scale for elementary practice, as one division or square can be taken to equal one inch of actual measurement. Our window, then, is to be drawn 72 squares high and 44 squares wide, with all other measurements found, in proportion, by counting squares.

This simple sketch, when accurately drawn with clean, definite lines of uniform color and thickness, has a quite technical aspect, and is sure to favorably impress the student who is making his first journey into the unknown and mysterious realm of interior decoration. It is not necessary to "figure" this second sketch (Figure 2), because all dimensions are stated on the freehand sketch.

Several tracings from the drawing on squared paper should now be made, for the purpose of showing variations on the simple type of window selected for measurement. Graphite (soft lead) may be rubbed on the back of the sketch and the outlines traced with a sharp, hard point; or Japanese rice paper may be used. Figure 3 shows the tracing; Figure 4 shows one variation; the upper sash is spaced into six small panes of equal size, while the lower sash remains as before. This treatment

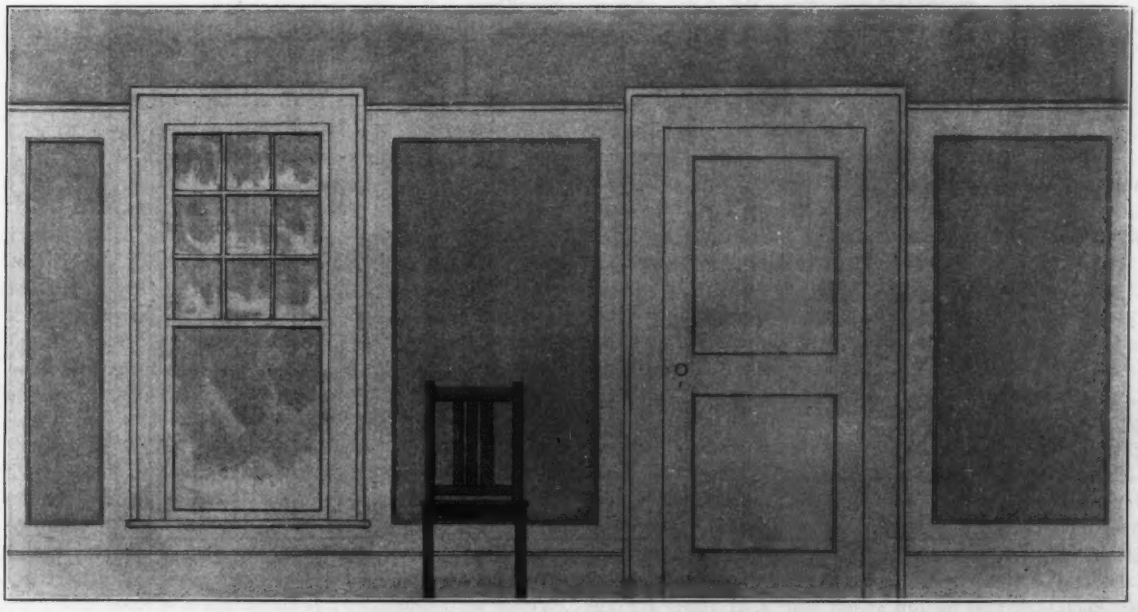


Fig. 11. ONE SOLUTION OF THE GIVEN PROBLEM.

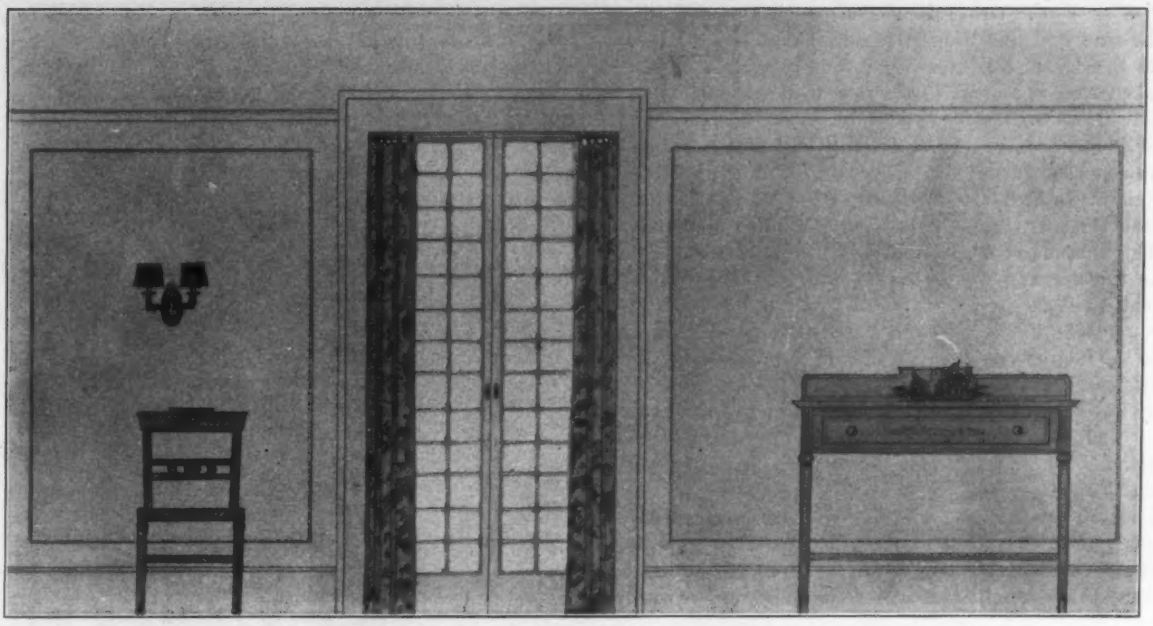


Fig. 12. A Problem Similar in Character Which May be Worked Out in the Way Described.

is frequently seen in modern houses, and is used for its decorative effect. Figure 5 shows the spacing of the whole window into small panes. This is a good style for certain windows where the opening is desired more for light than for the view outside. Such treatment is often used with clouded or semi-opaque glass.

The students may now be asked to make measurements and drawings from windows whose greatest dimension is horizontal. Or, the teacher may dictate the measurements for a horizontal window space. The freehand plan should be sketched as before, and the finished drawing made on squared paper. Tracings may be made, and many variations may be based upon the original sketch. Ideas and suggestions for this variety may come from the observation of houses, from good magazines like The Craftsman and others of its kind. The teacher should be ready with comment and with criticism upon all work in which the students have had an opportunity for individual choice. Eccentric or poorly spaced windows should be rejected, with full explanation of the reason for rejection. Collections of fine window and door spacings should be made by teacher and students. The foundations of refined proportions, rhythmic relationships and well-balanced parts should be laid, in all discussions of this work. Criticisms by the class, on the work submitted, will be found both interesting and valuable. Figures 6 and 7 are illustrations of two different treatments of the same horizontal window space.

The Next Step. Doors follow windows in natural sequence, as the next feature of interest in our study of interior decoration. Measurements are to be made at home and a freehand figured sketch brought to school, as the basis for future operations. It is best for the pupil to gain in this way ideas of stock sizes of doors and window frames and casings. Figure 8 shows a conventional door, with panels, drawn from measurements and reduced to scale by means of squared paper. Figure 9 shows a more interesting arrangement of spaces, drawn upon a tracing of the frame of Figure 8. Figure 10 is still another variation of Figure 8 and shows the type of door known as the French window. Here the opening serves the purpose of both door and window, as glass is introduced into the construction. Again the students should be encouraged to make drawings of interesting doors that they observe, and to study the spacing of doors seen in illustrations of beautiful houses. Collect photographs and cuts of doors, and make a study of fine old Colonial doors, now becoming rare, even in old Southern and New England cities.

The Elements of Furniture. As a preparation for exercises in interior decoration, the drawing in two dimensions of certain pieces of furniture will be found profitable. Chairs, tables, desks, dressers, etc., must of necessity conform with little variation to certain proportions. Students should measure the heights and widths of good types of simple construction. They should then make freehand, figured sketches from these measurements, afterward redrawing the sketches to scale on squared paper, as in the first exercises with door and window spacing. Much or little time may be devoted to furniture sketching of this kind, according to the requirements of the course. In an ordinary high school a half-term (10 weeks) could profitably be spent upon such exercises as are outlined in this article, up to this point.

Problem: To Design a Side Wall and To Locate In It a Door and a Window. In working out this problem the solution of which is shown in Figure 11, the dimensions of an actual wall in an actual room were taken as a basis. These walls were 9 feet high; the window frame measured 3′ 8″ x 6″ and the door frame

7′ 8″ x 3′ 6″. Other dimensions, such as the width of the side wall, the proportions of the panels, the height of the baseboard, etc., were found by measurements taken from a room. (The table of dimensions on page 159, October number, INDUSTRIAL-ARTS MAGAZINE, will be found useful when it is inconvenient for pupils to measure a room or furniture for themselves.) The preliminary sketch was made upon cross-section paper, a scale showing sixteen divisions to the inch being selected. This is a more convenient scale to use for room interiors, as the drawing would be too large to handle conveniently, if the scale used for detail drawings—twelve squares to the inch—were employed. Sixteen squares to the inch means a scale of ¾″ to the foot. The actual size of the drawing in this problem was 108 squares high by 204 squares wide, or, expressed in inches 6¾″x12¾″.

After the general dimensions of the room were indicated, including the depth of the frieze, the height of the baseboard, etc., rectangles expressing the proportions of a door and a window were cut from a separate piece of paper. These rectangles, properly scaled, were then placed tentatively upon the drawing, until they were balanced; that is, the rectangles were moved up and down, near together or farther apart, until they seemed adjusted to balance each other and to find their best placing, as elements of the side wall. Their positions were then indicated by pencil dots and the proportions and details of the window and door were carefully drawn, to scale. The chair was placed in the same way; a rectangle representing its proportions was drawn to scale and cut out. It was then slipped about on the drawing until the best adjustment was found. The position was then marked, and the outlines of the chair, expressing but two dimensions, were drawn.

When the drawing was completed, the entire sketch was transformed to a mounted drawing paper. The tracing was lined in with a sharp, medium soft pencil. A faint wash of light gray orange water color was placed in the wall panels; a still lighter tint of the same color was placed in the space for the frieze; a shade of gray orange was washed over the chair. All woodwork was left white. The success of this color wash will depend very largely upon the delicacy of the tints employed. Technical difficulties of water color handling immediately arise, when strong or decided colors are used. It is best for beginners to keep to color schemes of a high key and to keep color values near together.

Figure 12 shows the solution of a similar problem, in which the placing of a French window and two pieces of furniture were involved. This might be used as the wide wall of a dining room, with the convenient French window opening into a porch or veranda.

Our next and last problem in this series will show an interesting device for constructing a room interior of cardboard, with three side walls and floor space, drawn to scale and colored according to a definite color scheme.

THE position which we have to face then is this: the lack of beauty in modern life (of decoration in the best sense of the word), which in the earlier part of the century was unnoticed, is now recognized by a part of the public as an evil to be remedied if possible; but by far the larger part of civilized mankind does not feel that lack in the least, so that no general sense of beauty is extant which would force us into the creation of a feeling for art which in its turn would force us into taking up the dropped links of tradition, and once more producing genuine organic art.

William Morris.

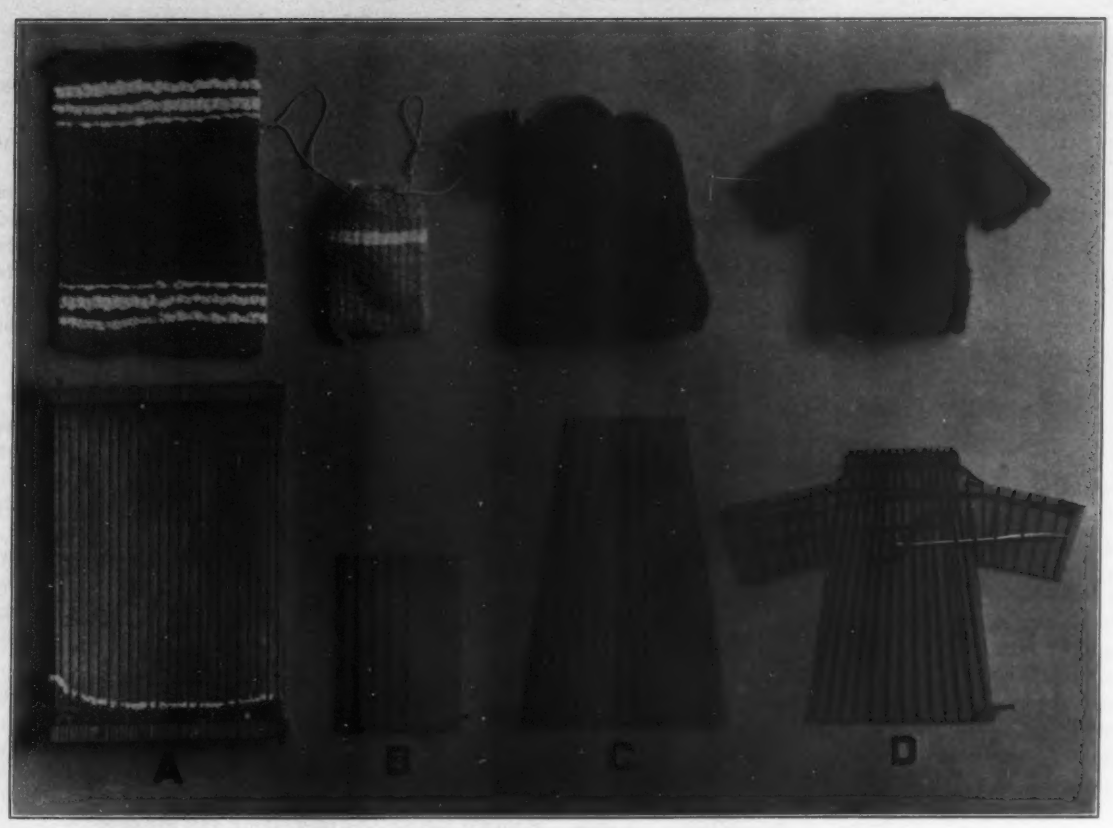


Fig. 2. SECOND GRADE CONSTRUCTION PROBLEMS.

Construction Work in the Lower Grades

Fred L. Curran, Instructor in Primary Handwork at the Stout Institute, Menomonie, Wis.

SECOND GRADE PROBLEMS.

Small Rug.

Materials:

Wood loom 6″x9″.
Cotton warp to string loom.
Wool warp or chenille in two colors.

Directions:

1. Fasten end of warp at one end of corner of loom and string up loom by passing back and forth thru saw-cuts in each end.

Fasten end of warp when loom is strung (See Figure 2, "A").

2. Select two colors of yarn, one for the body of the rug and one for the borders at each end. These borders may be made of one, two, or three bands and of varying widths. The teacher should make sketches on the blackboard showing different widths of bands which are good.

3. With a piece of yarn, about two or three feet long, begin weaving at one end and work toward the center. Use simple "over and under" weave as in first-grade problems.

4. Weave one end of rug, including border pattern, then begin at the other end and weave the same width bands. After both ends are finished, weave in the center.

5. When the weaving is done, remove rug from loom by slipping loop ends of warp threads carefully off the loom.

6. Tie each of the loose ends of the warp to the adjoining loop.

7. Pack the yarn to the ends of the warp threads and make the weave as even as possible thruout.

8. Trim all loose ends with scissors.

9. With a whisk broom brush both sides of the rug to make it look clean and fresh.

Marble Bag.

Directions:

1. Cut a piece of pasteboard of the desired size for the loom. (See Figure 2, "B." Marble Bag above and loom below.)

2. Make cuts at both ends of the loom about ⅜″ apart. The first cut near the corner should be about ⅛″ from the edge.

3. String the loom, using same material as will be used in the weaving. The Germantown yarn works up well in this problem.

a. Fasten end of yarn in one of the cuts at the corner.

b. Pass yarn to the corresponding cut at the other end of the loom.

c. Place yarn in cut and pass down the bottom side of the loom into the same cut from which we started.

d. Pass yarn to the next adjoining cut and up the bottom side of the loom to the corresponding cut at the top of the loom.

e. Pass down from this cut to the corresponding cut at the bottom end.

f. Continue in this way until the loom is strung. There must be an odd number of warp threads, counting both sides. The loom is strung in this way so that when the weaving is finished, the bag may be removed without cutting any of the warp threads.

4. With a piece of yarn, about two feet long, begin weaving at the end which is to be the bottom or closed end of the marble bag. Weave around the loom, engaging the warp threads which are on both sides.

Caution: In passing around the edge of the loom we must be sure to keep in mind the "over and under" effect which must be retained when the bag is taken from the loom.

5. When the weaving has proceeded to within about one-half an inch from the top of the bag, we insert two pieces of cord which are to be used in drawing together and fastening the top of the bag.

6. Finish weaving the remaining space.

7. Remove finished bag by slipping loop ends of warp from the one end of the cardboard loom and then removing the loom. In some cases it will be necessary to break the loom to get it out.

8. Trim loose ends of yarn and brush the work clean.

Doll's Stocking Cap.

Directions:

1. Cut a piece of pasteboard to the desired shape for the loom. (The loom shown in Figure 2, "C" is 7¾" long, 5¼" wide at bottom, and 3" wide at the top.)

2. Make cuts at the bottom of the loom about ⅜" apart.

3. Make one-half as many cuts at the top about the same distance apart, or make the same number of cuts and half as far apart.

4. String the loom with the same material as will be used in weaving. A soft yarn, such as Germantown or Zephyr, is best. In stringing the loom begin at one corner and proceed in the same way as in the Marble Bag except when passing around the top of the loom. As shown in cut, two warp strings are placed in the same cut when there are half as many cuts at the top as at the bottom.

5. Begin weaving at the top of the loom, going over two warp threads and under two. After weaving around several times weave over one, and under one, as usual. The same caution should be observed here as in weaving the Marble Bag.

6. When the weaving is finished remove cap from loom by slipping loop ends of warp threads off the loom at the bottom or large end of the cap.

7. Make tassel for cap as desired, using same material as used in weaving.

8. Draw top of cap together closer and fasten tassel in place.

9. Trim loose ends with scissors and brush the cap clean with a whisk broom.

For variety in making the stocking cap two colors may be used. One or two bands of color sometimes add much to the appearance. If these caps are to be made for the dolls of the children the looms should be made of a size corresponding to the size of the doll's head. Be sure to make them large enough because they will not stretch very much.

Doll's Sweater.

Directions:

1. Make loom of stiff pasteboard of the size and shape desired. (See Figure 2, "D," Sweater above and loom below.)

2. Make cuts at top and bottom of both the body of the sweater and the arms.

3. In stringing the loom be sure to leave the bottom of the sweater and the neck open. This is done by stringing back and forth on each side. In stringing the warp for the sleeves the threads are run around the cardboard.

4. Begin weaving at the neck of the sweater and work down.

5. While weaving across the body and arms of the sweater weave back and forth on each side in order to leave the ends of the sleeves open. (In Figure 2, "D" is shown the method of weaving and the order.)

6. When the weaving is finished, slip the loop ends of the warp threads off the loom at neck and bottom of sweater, and remove loom. It will be necessary to break the loom into several pieces before it can be taken out.

7. Trim loose ends and brush clean.

If desired the neck may be made higher and then rolled back when taken off the loom.

Besides developing more skill in handling these materials and tools, the children in the second grade will be gaining some ideas of construction which are involved in the making of these looms and problems. Homework in sewing and weaving may be started and encouraged at this age.

THIRD AND FOURTH GRADES.

When we reach the third grade the work enlarges in three ways: First, the size of the rug is increased to 9"x12". Second, each pupil develops and makes his own designs and may choose his own colors. Third, his knowledge of weaving becomes broader as he learns the limitations and difficulties which are presented in connection with the various designs.

Before the pupil is ready to make the design for his rug the teacher must be sure that she has laid the proper foundation. This to some extent may have been done during the first two years in drawing and construction work, but the minds of the children must be filled with ideas; they must be led to see good shapes and designs here and there, and finally, the teacher should show them many good suggestions in designs for these

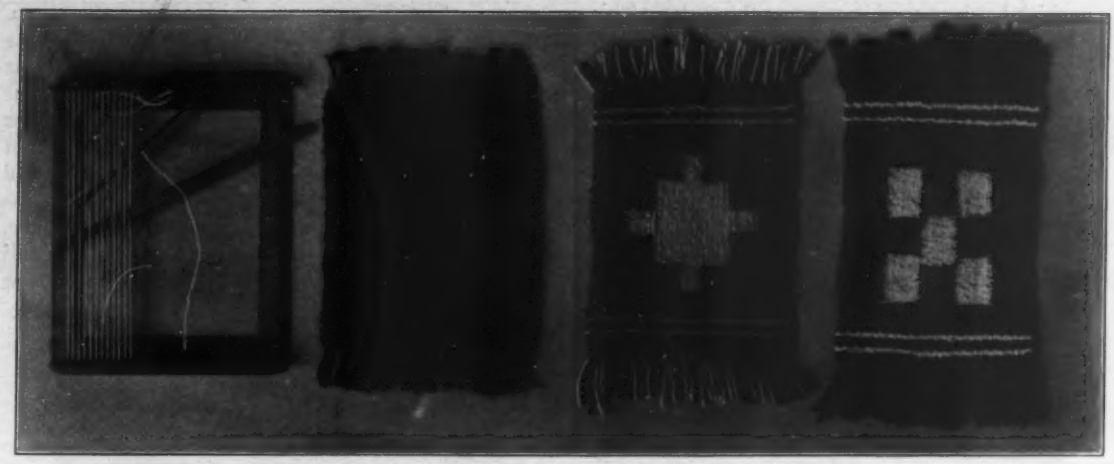


Fig. 3. LOOM AND PROBLEMS FOR THIRD AND FOURTH GRADES.

particular rugs which they are to make. She may do this best, perhaps, by having several finished rugs on hand in order that they may see the real results or objects. In addition to this, the teacher may make drawings on the blackboard showing good proportion and proper spacing. By using colored crayon she may make the drawings still more clear and attractive. In showing designs or making sketches the teacher should confine her own suggestions to such simple ideas as she thinks the pupils can work out. In the third grade the border pattern should be simple and the center design, perhaps, should be confined to varying proportions of the rectangle and cross. Diagonal lines should be avoided in both these grades.

When the teacher has developed such ideas and principles in design as she thinks may be used, the children are then given paper and pencil, and they begin to represent on paper some designs which they would like to make. At first they should make many small designs about 1"x1½". Then, with the teacher's help and criticism, one of these small designs is enlarged to full size, 9"x12". Portions of the design are usually filled in with pencil or crayon in order to get the effect of the design. Colors may be considered while making the design, or may be chosen after the design is completed.

In Figure 3 we have shown the loom at the left and three types of patterns which can be handled by children in the third and fourth grades. In Figure 4 are shown some patterns which may be worked out as supplementary work or whenever a variety is needed. All of the rugs shown in these two cuts were made by children in the third and fourth grades. While there is always a temptation to make fancy and unusual patterns it is better to emphasize simplicity, good proportion, harmony of lines and color, and quality of work.

In the making of the rugs shown in Figure 3 there are three points to note:

a. Order of procedure.
   1. Begin at one end and weave in border pattern.
   2. Begin at other end and do likewise.
   3. Weave in center design.
   4. Weave in body or rug around center design.

b. In weaving body of rug at sides of center design, the yarn should pass around the last warp thread

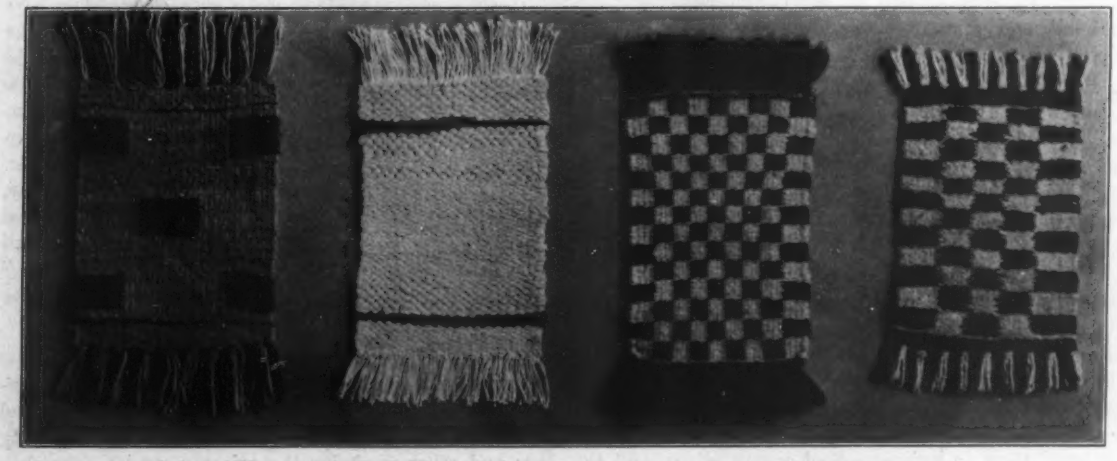


Fig. 4. RUG PATTERNS BY THIRD AND FOURTH GRADE CHILDREN.

which has been used in weaving the center. This holds the rug firmly together at these lines of joint.

c. The fringe is put on each end of the rug after the rug is complete and taken off the loom. Several pieces of yarn are put thru the loop ends of the warp threads and tied. Any one of the several kinds of common knots may be used in tying.

In Figure 4 the second rug from the left is made from strips of cotton cloth cut to width, and woven in the same way as the various kinds of yarns in previous problems. The fringe is made with white cotton warp. In the two rugs at the right, in the same illustration, the pattern is produced by running one color under four warp, then weaving over one and under one for four threads, then under four again, etc. The other color is used in the same way, alternating with the first color. Two colors of yarn and two needles are used continuously in such patterns as these. Because of the method of weaving, these two rugs are not reversible. The one side appears somewhat rough and irregular. All of the other rugs in Figures 3 and 4 are reversible, each part of the pattern having been woven in separately.

PRINTING IN THE SCHOOL

Leonard B. King, Canton, Ill.

PRINTING, as a school subject, is a comparatively recent thing, but already it is coming into much favor. In these days a printing teacher who attends a manual-arts convention is reasonably certain of meeting other teachers of the same subject. His conversation with these other teachers will convince him, however, that while there is considerable agreement as regards the general value of printing as a school subject, there is yet some uncertainty as to definite aims and methods of procedure.

Printing has much to justify its introduction into the schools. First of all, it is a very fascinating subject and inspires interest as do few other subjects. It furnishes boys, and girls as well, an opportunity for community service, something which increasingly appeals to them. It is "real life." Again, it is a distinct aid to English work, at least so far as the mechanical side of English is concerned—with such matters as spelling, division of words, punctuation and the like. It involves some knowledge of art, and some elements of design must be taught in connection with the work that a school office is likely to do. Such desirable qualities as accuracy, neatness, and deftness may be expected to follow in an appreciable degree the introduction of school printing. In some schools the work may be primarily vocational and aims to train boys for the printing trades.

But the school print shop is proving valuable in another way. It furnishes a fine field for the development of student initiative and power. Ability to know what one wants to do, and power to perform the desired thing, are both at present considered a proper purpose of educational efforts, and the school office permits methods that tend to develop such ability and power.

The office of which the writer has charge is a part of the Manual Training Department of the Canton, Ill., Public Schools. It was installed nearly six years ago, and apparently was one of the very earliest in the state to be established by a board of education. At about this same time our local schools began an attempt to meet the social needs of the young people of the community, to interest them in various school organizations, and to place the responsibility for such organizations in their hands. Courses of study were modified in many ways that the greatest good of the greatest number might be accomplished. Presently the schools, especially in the higher grades, began a phenomenal growth which has since continued out of all proportion to increases in the teaching force. This has meant less faculty supervision of much school work. The printing office has felt the effect of these changing conditions, and more and more its responsibilities have been shifted to student shoulders. This has been something of a blessing in disguise, for while the original purpose of the office—the improvement of the English work—has not been lost sight of, the socializing possibilities of the work have been given earlier and larger recognition than they might otherwise have received.

The activities of the office center about the "Pennant," a small weekly paper. Tho unpretentious, it is almost absolutely the product of student endeavor. All the copy is written by pupils and edited by student editors. A faculty critic holds veto powers, but these are rarely exercised. All the material is hand set, the proofs are read and corrected, the forms made up, the impression prepared and the run made, all by school boys. The teacher ordinarily reads the final proofs. The business manager, a boy, wraps and mails each issue. The boys understand that unless they get copy in and do the necessary work, the paper will not appear. The old days, when the teacher worked overtime in feverish haste to complete a student enterprise, are happily over. Instead, one of the editors, or managers, gathers extra help, assigns work and pushes the paper back to schedule. On such occasions the problems of discipline disappear, tho this rush period always takes place at a time when no teacher can be present. During a recent basketball tournament the boys planned and executed two "extras," getting student printers out of bed at daylight, in order to "scoop" the local dailies.

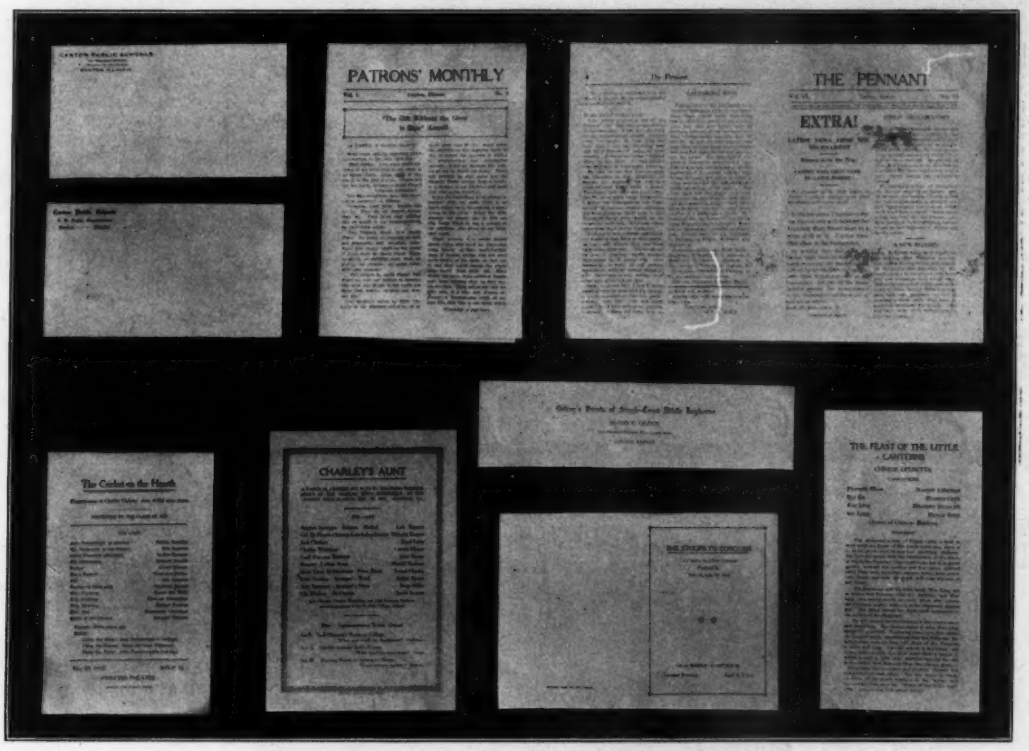
Other printing, besides the paper, is done. Tickets and programs for class plays, debates, declamatory contests, and other entertainments, various card forms used in the schools, letterheads and envelopes, and spelling lists and other work for the primary grades, furnish a

SMALL "JOBS" DONE BY STUDENTS IN THE CANTON SCHOOL PRINT SHOP.

A CORNER OF THE SHOP.

variety of work. Any excess of work is diverted to commercial offices. Courses of study for the grades have been printed, but in these the bulk of the work has made linotype assistance necessary.

Pupils do some printing for themselves. One boy, the leading amateur wireless operator of the city, has submitted a good scheme for his letterhead. Another boy, who is a chicken raiser with a large mail-order business, does a large part of his own printing, and gets results superior to some he has received from commercial offices. He makes his "layouts" very carefully, and from the advertiser's point of view.



JOBS PRINTED BY STUDENTS OF THE CANTON SCHOOL PRINT SHOP.

In still another way the abilities of the pupils are developed. During necessary absences of the teacher in supervising grade manual training, the printing office activities go on under the direction of some boy designated as foreman. Advanced pupils are detailed to show new pupils how to cut paper, oil and clean the press, take galley and press proofs, and do such other work as may be safely intrusted to them. Thus in every way that suggests itself the printing course aims to cultivate student initiative and self-confidence.

It must not be inferred that our printing office is unique among the activities of the school in developing such qualities as have been named. The "social idea" inspires the whole program of school work, and the printing office receives the benefit of socializing influences contributed by other departments, as well as contributing to such influences itself.

Printing seems destined for further growth and wider influence in school work. No doubt there are teachers who are considering it as an addition to their courses in the manual arts. Its cost is not prohibitive; in fact, few manual-art subjects may be introduced at less cost. That a school office may be wholly, or in part, self-supporting need not be overlooked. Expensive outfits costing six or seven hundred dollars are not essential, however desirable. Two or three hundred dollars or less will furnish a good beginning outfit. The leading type founders now issue lists of equipment that are admirably suited to school needs. Lack of experience will deter some, tho this need not be an insuperable obstacle. Excellent textbooks are already on the market, and normal and other schools offer summer courses in printing. In some places available resources may permit the employment of a trained printer. As experience accumulates, the content of satisfactory printing work may be more intelligently determined, and the art elements of printing, the refinements of book composition, and the vocational and socializing features of the work may be properly subordinated to each other. And, eventually, printing will probably occupy in the new education the place to which, by reason of its rich possibilities, it is properly entitled.

Organization of Administrative Material

Examples for the Teacher of Manual and Industrial Arts

Prof. F. D. Crawshaw, University of Wisconsin

(Third Article)

AS suggested in the first article in this series there are two quite distinct classes of organization problems both for the teacher and for the supervisor of the manual and industrial arts. One deals with teaching material, the other with administrative material. In each class the problems for the teacher are quite different from those for the supervisor unless, as is sometimes the case, an individual is both teacher and supervisor. For such, the problems suggested in this outline, for the teacher, should be considered in connection with the same class of problems for the supervisor, to be discussed in a future article in this series.

In dealing with the organization of teaching material it was possible to relate most problems sequentially.

The discussion of this subject in the October number of the INDUSTRIAL-ARTS MAGAZINE drew attention to the chronological order of the problems presented. In fact there was given what may be regarded as a formula by which an instructor might be helped, step by step, thru a class period and, by repeating the formula day by day, receive continued aid, for an indefinite teaching period.

The organization of administrative material cannot be handled in this way. Problems in this category relate more particularly to the *handling* of a class than to the teaching of a class. They are in many cases administrative devices which, when used, apply not to particular periods in the term, to any one class hour but to the term as a whole, or all class hours. They will be dealt with in this article under separate headings, and will, in some cases at least, be unrelated.

Arrangement of Equipment.

As one studies the arrangement of equipment in a business establishment, whether it be a salesroom, drafting-room, office or shop, he begins to appreciate the thought and care that went into the planning of the different elements to eliminate, so far as possible, waste in time and energy in the operation of the plant. Each unit is so located that the responsible party has sufficient light and room, all essential tools and supplies, and is adjacent to other units with which the work of his is closely related.

It is upon this basis that the equipment in a drafting-room or shop should be planned. When a class enters a room each member in the course of his journey to his particular bench or table should be able, if possible, to discard his street wraps, don his working clothes, receive his instructions, secure the necessary supplies and begin work, without retracing steps or otherwise losing time and causing possible confusion. The journey from the room should be made in an equally orderly manner. When at his place of work, too, he should have all tools and supplies which he will ordinarily use easily accessible, that he may not leave his place except for some unusual reason.

Figure 10 shows the arrangement of a bench woodworking room and a machine or mill room in their rela-

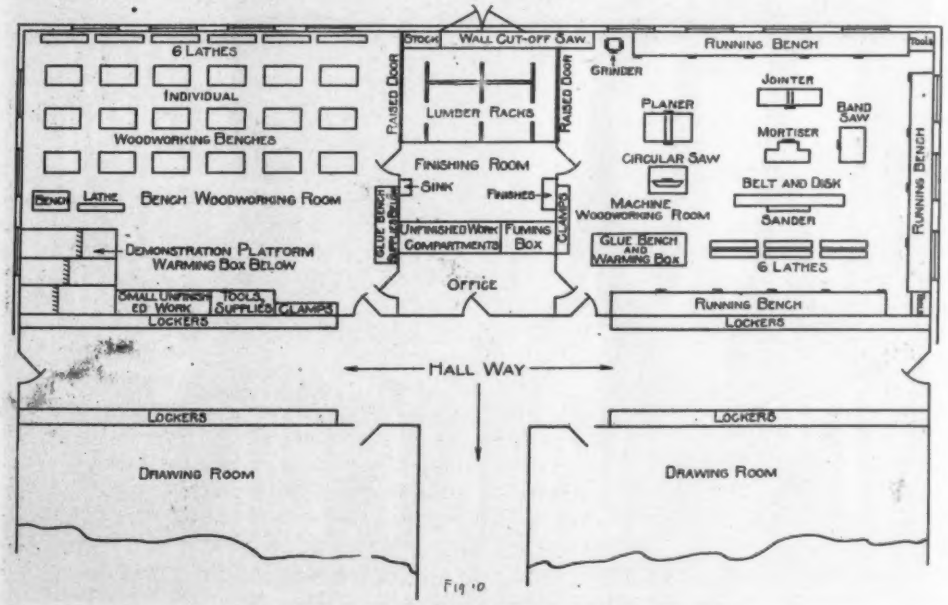


Fig. 10. FLOOR PLAN FOR SCHOOL WOODWORKING SHOP.

Fig. 11. "Open" Equipment Type of Woodworking Bench and Drawing Table.

tion to adjoining rooms. Note the position of the benches with reference to the stockboard, glue table, demonstration bench, etc., in the woodworking room and note also the economy of arrangement of the set of rooms for elementary and advanced woodworking.

There is indicated in the machine room in this figure an arrangement of machines to accommodate to the best advantage the handling of material as it goes from the raw to the finished product.

In this room the benches are used merely as an accessory to the machines and hence are near all machines, in good light, and are of the substantial, continuous type to accommodate long as well as short material.

Type of Equipment.

The type of equipment, as well as its arrangement, determines to a large extent the efficiency with which manual and industrial-arts work can be carried on.

In general there are two types of equipment—the "open" and the "closed." By open is meant that all essential individual tools are placed so that they may be easily and quickly checked up by one individual. In an open equipment bench woodshop or metalshop all tools which are kept at the individual's bench are *on* the bench rather than in it. All general class tools, too, are kept on an open board rather than in a cabinet under lock and key.

Such a board to be sure may be in a large cabinet back of glass doors which are easily locked. These should be movable, preferably by such a means as a sliding track, that they may be put out of the way during the class period.

See Figures 11 and 12 for examples of the open equipment for individual and stock bench-woodworking tools.

By closed equipment is meant the housing in of all tools. At the individual drawing table or shop bench, tools are kept in drawers or lockers. In such a system class tools are kept in a tool-room or a locked case.

Without question there are advantages in each of the two systems mentioned.

From the standpoint of administrative efficiency the open equipment enables an instructor to check up in a very short time all tools in a room, both individual and class. On the other hand in such a system each set of individual bench tools is used by some individual in each class, and therefore it is difficult to place responsibility for the care of tools and also for their misplacement and loss. To overcome this difficulty the essential tools or parts of tools, such as chisels or plane-bits in a

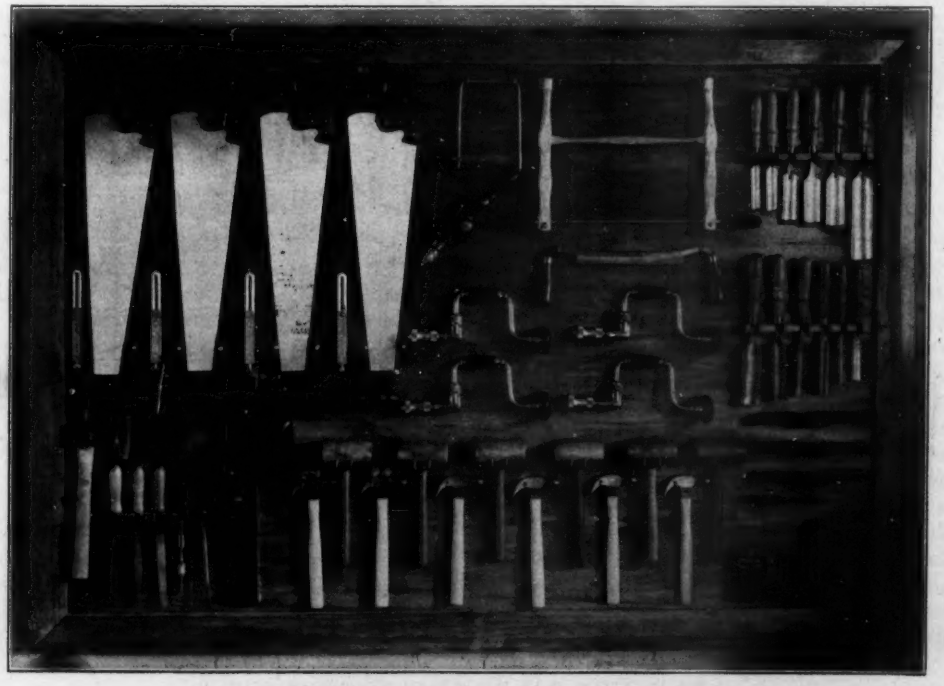


Fig. 12. "Open" Equipment Type of Board for Stock Woodworking Tools.

Fig. 13. Toolroom in Racine, Wis., School. 1. (Left) Exterior, Looking thru Door. 2. (Right) Interior Showing Wall Tools and Individual Student Drawers in Cabinet.

woodworking equipment, and the set of drafting instruments in a drawing equipment, are assigned to individuals who care for them in locked drawers at the bench or desk, or in a room cabinet. In any case each tool should be stamped with a number corresponding to the number of the bench or desk upon which it is to be used. Every tool should have a place and should be kept in its place.

This is the plan of a closed equipment. It enables the instructor to place responsibility upon individuals for all tools assigned to them. The placing of responsibility in the use of an open equipment is difficult, but can be partially effected by having a printed list of all individual tools in the hands of each pupil. At the beginning of the class period each member of a class reports any losses or breakages by properly checking his list and handing it to the instructor. The responsibility is thus placed in the class which last worked in the room.

A modification of these two plans provides for tools to be kept in trays which are locked in a stockroom case at the end of each class period. This plan has the advantage of definitely placing responsibility and, to a certain extent, enabling the instructor to check up tools at the end of each and every period of classwork. If he stands near the stockroom case, as for example, at the door of the room in which the case is kept, he can easily scrutinize these trays as individuals pass in order from the room, and as the trays are deposited.

For examples of closed equipment see Figures 13, Nos. 1 and 2, and 14, Nos. 1, 2 and 3.

Figure 15 shows the usual type of "closed" equipment woodworking bench and drawing table. Each member of a class is assigned a drawer in both bench and drawing table. The drawer contains the tools which the individual student alone will use. He has the only key, except the master key held by the instructor, which will unlock it. He is therefore made entirely responsible for its contents. Such an equipment necessitates the duplication of all individual tools for all classes and is therefore expensive to install. It does not eliminate the necessity of a tool-room, cabinet or board for stock tools but provides only for the assignment of a set of tools to each individual.

The points to note in each of the systems suggested are these:

1. Individual student responsibility for the care of tools used.

2. The ease with which an instructor may check up all tools at the end of a class period.

3. The expense of providing a large number of pupils, arranged in several sections, with the necessary individual and class equipment.

The size and number of classes to be handled in any one day will largely, if not wholly, determine the type of equipment to use. In any case the speed and precision with which classwork may be begun and ended in the short periods for ordinary public-school manual and industrial-arts work should be a controlling factor in the selection of a type of equipment. It is an essential factor in teaching efficiency looked at from an administrative point of view.

Craftsmanship vs. Production Methods.

With the emphasis which has been placed upon industrial education within the past few years the attention of manual and industrial-arts teachers has been drawn to a consideration of values in individual or craftsmanship work as compared with production work. It has been customary for most instructors to assign to members of shop classes complete individual projects. In these a pupil is required to plan and construct some one entire piece. By this procedure he should learn how best to economize his individual time and effort. He does not learn, however, the economy of time and effort under commercial production conditions which deal not with the individual but with a group of workmen.

To familiarize pupils with the organization which considers this type of economy, and to give them as nearly as possible the experience they would get in a production shop organization, two things may be done in our manual and industrial-arts departments, viz.:

1. Plan for the design or construction of two or more similar projects to be made by a group of individuals—sometimes the entire class.

2. Plan for the routing and jobbing of work in the department to correspond with a similar process in a commercial plant.

Under the first of these two plans the chairman of the department will plan to construct in his classes articles which may be for some party other than the individual pupil—articles for the school or for sale in the open market.

1. Cabinet Locked. 2. Cabinet Open.
Fig. 14. Cabinet for Storing Individual Students' Tool Kits.

Under the second plan he will organize his department so that a job will pass from one part of the department to another in a systematic manner, regulated by an efficient accounting system and produced by a combined effort of all members of the class.

Example—An order may be taken to construct twelve teachers' desks. The design of these and the drawings for the same would be made in the drafting room. From the drafting room the blueprints of the desks would go to the shop and here all work would be divided up and cared for by groups under job orders.

Thus a class in the woodworking shop would organize into groups, each group under a pupil foreman directing the activities of each individual in the group who in turn becomes responsible for a particular kind of work such as the construction of (1) legs, (2) rails, (3) tops, etc.; or, a different arrangement for determining and caring for jobs might be made, in which for any particular day one group would be getting out stock, another milling or dressing stock and still another glueing up stock, etc.

Fig. 14-3. Detail of Drawer for Individual Kit.

A question arises as to the sufficiency of the production work organization if it is used exclusively in a class. Those who are concerned only with the special industrial school may believe that it has all the advantages of the older craftsmanship plan of individual project work. The teacher who has been trained to analyze a shop process with reference to its *disciplinary,* as well as its mechanical values, and who is interested in the manual and industrial arts as a *general,* as well as a special educational means, probably will not agree in this premise. He believes there is good in both plans.

The first employs carefully graded tool manipulations in a course designed to develop sequential processes in some industry.

The second emphasizes economic production thru group organization.

It is safe to assume that where both are used in the work of any one term they should be placed in the order given here—craftsmanship method first, and productive method second.

Fig. 15. "Closed" Equipment Type of Work Bench and Drawing Table.

A Little Argument on Great Principles

(Continued)

"BUT my dear Try Square," contended Frills, "You must concede that a joint is but a part of a construction and as such is not a subject for design."

"Not a subject for design!" exclaimed Try Square. "Do you know, Mr. Frills, there are joints for tension; joints for compression; joints for shear, and joints innumerable for conditions under each of these stresses? If the joints are not well designed it is useless to consider the design of the whole construction."

"No! Not useless, Mr. Try Square," answered Frills with conviction. "But, I must confess, it seems well near hopeless, unless you and I co-operate and lend our combined talents to the cause of education."

"Oh, very well! Very well!" said Try Square condescendingly. "And to begin this co-operation suppose you just cast your aesthetical eye over these blue-prints of mine. I have but one request to make of you, Mr. Frills. Please do not disturb the order of them for I have them very carefully arranged. It is a hobby of mine that systematic order is the first and last necessity of good teaching, and these blue-prints represent one hundred lessons for one hundred sessions. Now! I shall be able to tell by the tick of the clock just what any one of my teachers or his pupils are doing this year."

"Try Square! You are a wonder!" exclaimed Frills; "Here you are not yet thirty and your life-work is complete. Do you mean to tell me that these blue-prints represent the exact objects your pupils will make this year?"

"Exactly! Exactly! Mr. Frills, or they will not receive credit in manual training. In Peace as in War it is Order and Discipline that make for success."

"I quite agree that Order was the first success," meditated Frills. "Of course we know that Order came out of Chaos after the creation. But, Try Square, that was some time ago. Several things have happened in this old world since Order prevailed. In fact, I doubt if anything would have happened since the creation if some one had not been disorderly. Did you use these same blue-prints last year, Mr. Try Square?"

"Yes," answered Try Square. "And the year before last, except for some little changes in the order. You see, Mr. Frills, an order of exercises is a development; an evolution, if you please. Here a thought, there a suggestion, and a slight adjustment is made in the sequence of exercises which makes them perfectly adapted to conditions."

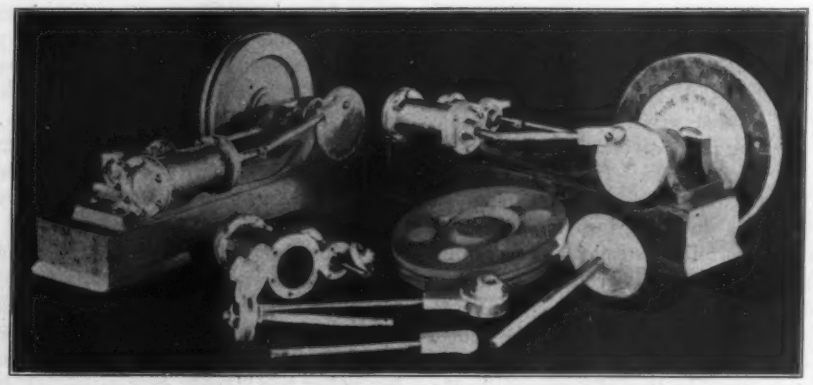
"Ah!" exclaimed Frills. "And what then? The Millennium? You must have this order of exercises published, Mr. Try Square. Call it *The Millennium of Manual Training* and give suffering humanity the blessing of perfection."

"I presume from your remarks, Mr. Frills," answered Try Square with cool disdain, "that you do not believe in orderly teaching. You insinuate that order is commonplace and that disorder is progressive. Are those the principles on which Art is taught? I have wondered if it was taught on any principles at all."

"Well! There is a question if Art is ever taught at all," answered Frills. "Some contend that it is Caught rather than Taught. I am convinced that it will do no harm to 'expose' Manual Training Teachers to an Art atmosphere, but it cannot be taught by *one hundred blueprinted lessons for one hundred sessions.*"

"To be sure there are principles of Art; guides along the way to a degree of success; unity thru balance; rhythm and harmony; but—

" 'Tho we travel the world over to find the beautiful, we must have it with us or we find it not'."



Two Engines and Parts Made in the Oyler School Shop by Mr. Kuns's Pupils.

See Pages 200-205.

INDUSTRIAL-ARTS MAGAZINE

Board of Editors

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EDITORIAL

OPINIONS.

IT is a great misfortune to be opinionated, but it is pathetic to have no opinion at all. The public demands people with opinions. It desires people who are willing and ready to express their opinions *as opinions* based upon some experience with the problems under discussion.

The opinionated, "cocksure" man states his position as eternally infallible and scorns or pities all who do not agree. The sane, reasonable, and helpful person—the one who wins our confidence—is the one who has thought thru the problems touching his immediate field, who has opinions regarding them which he willingly and frankly states, but who does not assume at each conclusion that he has tapped the fountain of ultimate and irrevocable truth.

It is a good plan to do one's own thinking. Teachers especially should know *what they think* and where they stand on questions touching their work. There is no one thing which gives one a standing in the estimation of others sooner than the ability to give a ready, well-thought-out opinion on any of the questions on which he is supposed to have information.

This piece of advice for young teachers and others who may need it: Avoid the appearance of being opinionated, but always be ready on proper occasion, with a frank, modest statement of logical opinion.

PETTY GRAFTING.

WITHIN the past few weeks a concern which publishes textbooks on technical subjects, has written to a "selected list" of teachers and supervisors of manual and industrial arts, offering to sell them stock in the concern at a somewhat reduced price. The letters state that the concern is paying large dividends and that this is an exceptional opportunity, etc. It is such an unusual occurrence for a school teacher to be offered an opportunity to buy stock in a paying business at a reduced price, that we are a little suspicious concerning this unusual generosity. Far be it from us to look a gift horse in the mouth!

However, it is not altogether a new idea for school superintendents and others whose positions are such that they can influence the adoption of textbooks in the public schools, to own stock in book publishing concerns. But let us not attempt to deceive ourselves by thinking that this practice is altogether legitimate and ethical. The teacher or superintendent who recommends the adoption of a textbook or the use of any material in the schools because he is financially interested in the sale of that book or material, is a grafter of the same type as the city alderman who recommends the purchase of paving material in the sale of which he is clandestinely interested, or the congressman who opposes the Parcel Post because he owns stock in an express company, or the engineer who specifies the use of certain material in a construction project "for a consideration."

It is rather inconsistent to protest vehemently against "special privilege" when the United States Steel Corporation or the Standard Oil Company is concerned, and then use our positions for our own private gain. The teacher who recommends to the school board the use of a certain material merely in order to gain the support of the makers in securing a new position, is of the same type as the congressman who votes for a law in order to secure a contribution to his campaign fund. The only difference is that the former is so much cheaper than the latter.

A WRONG ATTITUDE.

THERE is a certain attitude on the part of many teachers which is by no means a wholesome sign of progress. We speak of the attitude of those who confine their vision and their thought entirely to their own little special lines, in utter disregard of the other interests and lines of work which go to make up the field of education. We are too much inclined to try to break up the school field into a lot of separate, distinct, and unrelated "specialties." We seem to hope that, altho we are unable to do it ourselves, in some mysterious way the student will be able to assimilate and unify these apparently conflicting elements.

We need broader vision. We need to rediscover the principle of correlation and to give it a saner and more effective application. A teacher who wishes to succeed in any large way in the industrial arts, whether in manual training, domestic science, art, or vocational subjects, must have a keen appreciation of the principles and value of the other lines and must keep himself or herself informed as far as possible as to their matter, methods, and procedure. Especially is this true of those principles and methods which are the common factors of all the arts. It is still further true that the teacher who has the best grasp of the school problem and spirit in the regular academic lines and who merges himself or herself most completely in the composite activities of all the school, will win the most lasting success and will do infinite service that otherwise would remain undone.

Think of the manual training teacher who scorns design and says that he has no time to read about art principles, since they are "out of his line!" Think of the teacher of art who says that needlework, printing, etc., belong to other departments and hence are "out of his or her line!"

We draw our lines too narrowly. We have a common problem to solve—*an enormous problem*—and it is high time that we take advantage of every possible rela-

tion in the various fields of art and bring it to bear upon our own specific undertakings.

Let us broaden our interests, inform ourselves as to the nature and merits of everything that touches or relates to our fields of effort; quicken our response to the needs in any department; and be ready to cooperate in every possible way for the common cause of all the arts. Loyalty, intelligence, and helpfulness in all the possible activities and interests of school life and education will hasten the solution of the intricate problems that are now pressing upon us.

IMPERSONAL DISCUSSIONS.

In our discussions of educational affairs we are all more or less inclined to inject too much of a personal nature. We are all so much in earnest and so enthusiastic concerning our pet theories that we fail to see any but our own side of a question.

If we will always remember that the person who disagrees with us may be just as intelligent, and just as sincere as we are, and that there is always a possibility that his view is the correct one, we will be much more tolerant, and we ourselves, will be much more agreeable to everyone with whom we come in contact. Furthermore the effort to see the subject as the other person sees it will place us in a much better position to make him see the subject as we see it.

Above all, we should always omit the personal element from our discussions. In considering the opinions or theories of any person we should be able to consider the theory or opinion as entirely separated from the person. We should also be able to have our theories and ideas shattered without taking offense or harboring any ill-feeling toward the shatterer. Until we can do this, we should keep out of discussions of any character.

NATIONAL AID TO VOCATIONAL EDUCATION.

The Report of the Commission on National Aid to Vocational Education has been submitted to Congress together with a bill proposing that national aid be granted. It has been suggested, however, that, on account of the condition of the finances of the Federal government, it may be necessary for this bill to lie on the table until some future session of Congress.

If there ever was a time when national aid to this cause was needed, that time is right now. Manufacturers in all parts of the country are finding that it is impossible for them to employ skilled mechanics who can duplicate the articles which they have heretofore had made in Europe. If the manufacturers of the United State are now to compete with the manufacturers in all parts of the world, they must have employees who are in skill and intelligence, the equals of the artisans in any part of the world.

The report of the National Commission states: "Vocational Education is a wise business investment. In the last analysis expenditure of money for Vocational Education is a wise business investment which will yield larger returns, not only in educational and social betterment but in money itself, than a similar amount spent for almost any other purpose." The report then proceeds to demonstrate that a system of vocational education would increase the wages of the working men and women of the United States $2,500,000 a day or $750,000,000 a year.

Our statesmen and financiers have been urging the business men of the country to "sit still in the boat" and have censured the banks for "hoarding" their cash, etc., yet in this case, where it is pointed out that the government itself can make an investment which will pay a dividend of over 100 per cent a day, it refuses to do so. The total amount of the proposed national grants for the first year is something less than $2,000,000.

At the present time it seems that National Aid is the one support which is needed to make Vocational Education an established fact in every state, and it is to be hoped that the present session of Congress will not be adjourned without passing the proposed law.

In much of the prevalent discussion on this subject there is one point which seems to have been overlooked. The grants from the Federal government seem to be looked upon as a gift; as tho the Federal government were a separate institution and any fund which may come from that source is a gratuity for which we return nothing, and if we can prevail upon Congress to make us a grant, we are just that much ahead. Certainly educators know that this is not true. Regardless of which political unit levies the tax, the money comes from the same source, and if the money is to be distributed equally over the country, it will go right back to the source from which it came, just the same as tho the tax were levied by the state or county. It is simply taking money from one pocket instead of the other.

If such financial aid is to be given to all the states permanently, we cannot see that there will be much difference between that system and the one in which the tax is levied by the state directly. The only difference is that when the National government levies an indirect tax, we pay it without knowing or realizing that we are doing so.

The important question is, will the funds be expended more economically and to better effect by the national government than by the state or city government? The political unit which will collect and spend the money the most efficiently is the proper one to handle it.

If a large amount of money is given to a community without that community's feeling that it pays the bill, it is a question if that community will spend those funds as economically and to as good a purpose as if it collected the money itself and realized and appreciated the fact. It has been said that it is a difficult thing to give anything to anyone and have the gift fully appreciated. In other words a person appreciates the things which cost him something, and gets out of any undertaking just what he puts into it.

"Art is rhythmic expression of feeling."—Harold Speed.

"Art is expression of pleasure in work."—William Morris.

"Art is the expression of the invisible by means of the visible."—Fromentin.

"Art is an action by means of which one man having experienced a feeling, intentionally transmits it to others."—Tolstoi.

HOW IT WAS DONE!

The purpose of this Department is to present monthly a wide variety of shop projects which have been actually worked out in elementary, high, trade and continuation schools. Contributions are solicited and will be paid for—THE EDITORS.

MACHINE FOR TESTING AEROPLANE PROPELLERS.

D. K. Hiett, Cincinnati, O.

THE AEROPLANE has supplied material for many manual training teachers and their pupils, and the machine is doubtless a valuable subject for study and experiment.

A number of high-school boys having formed a club for the study of the aeroplane, found themselves confronted with the problem of building efficient models; and after some discussion, they concluded that they should have some way of testing the efficiency of various types of propellers.

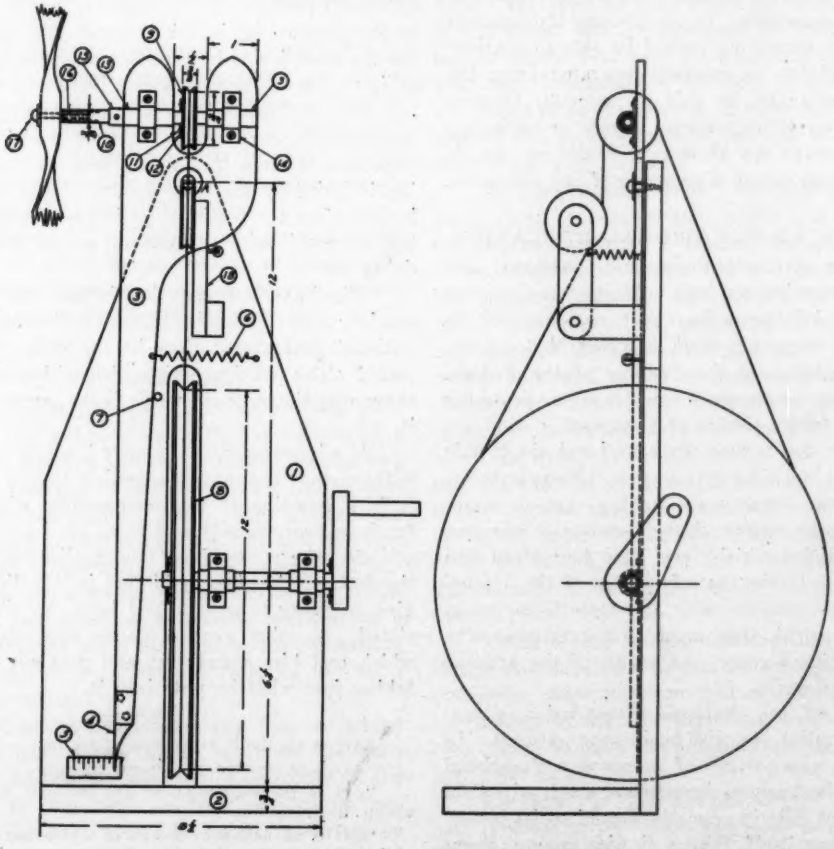
The machine shown is designed for testing the vital parts of their models. For the propeller tester, the standard (1) should be made of half-inch wood and fastened to a base (2) which is secured to a table top when in use. The slot in the standard (1) is just large enough for the free movement of the drive pulley. The arm (3) should be made of quarter-inch wood, preferably of two eighth-inch pieces glued together, in order that the arm may not warp.

If a piece of brass tubing, just large enough for the body of a round head screw, be forced into the wood, at A, the arm will move more freely. Without a belt tightener, this point should be placed about one-quarter inch to the right of the center line of the two pulleys, in order that the belt may tighten at high speed. A brass point, or needle, (4) is placed at the end of the arm (3) and travels along an indicator (5) on the standard (1). A light tension spring (6) holds the arm against the stop (7). The pulleys (8 and 9) may be made on a lathe of dry wood, which will not warp, or cut out by hand from two pieces and glued together.

The shaft (10) for the pulley (9) is made of a piece of three-eighths inch telescope tube. A pin (11) is fitted tightly into the tube and a staple driven over this into the pulley preventing the pulley from turning on the shaft. The same method of fastening may be used for the drive pulley. Pieces of telescope tube (13) fitting over the shaft (10) serve as bearing and are held in place by strap (14). A piece of tube (15) pinned to the shaft takes the thrust of the propeller.

The inside of the shaft (10) is roughened slightly with a file, and babbit (16) is poured in to a depth of half an inch. The one-eighth inch machine screw (17) which holds the propeller in place, forms its own thread in the babbit after a small hole has been drilled. Of course, great care should be exercised in locating this hole centrally.

Telescope tubing is used for the shaft, and bearings for the drive pulley. The crank handle is prevented from turning on the shaft with a pin, in the same way that the pulleys are fastened to their shafts.



PLANS OF MACHINE FOR TESTING AEROPLANE PROPELLERS.

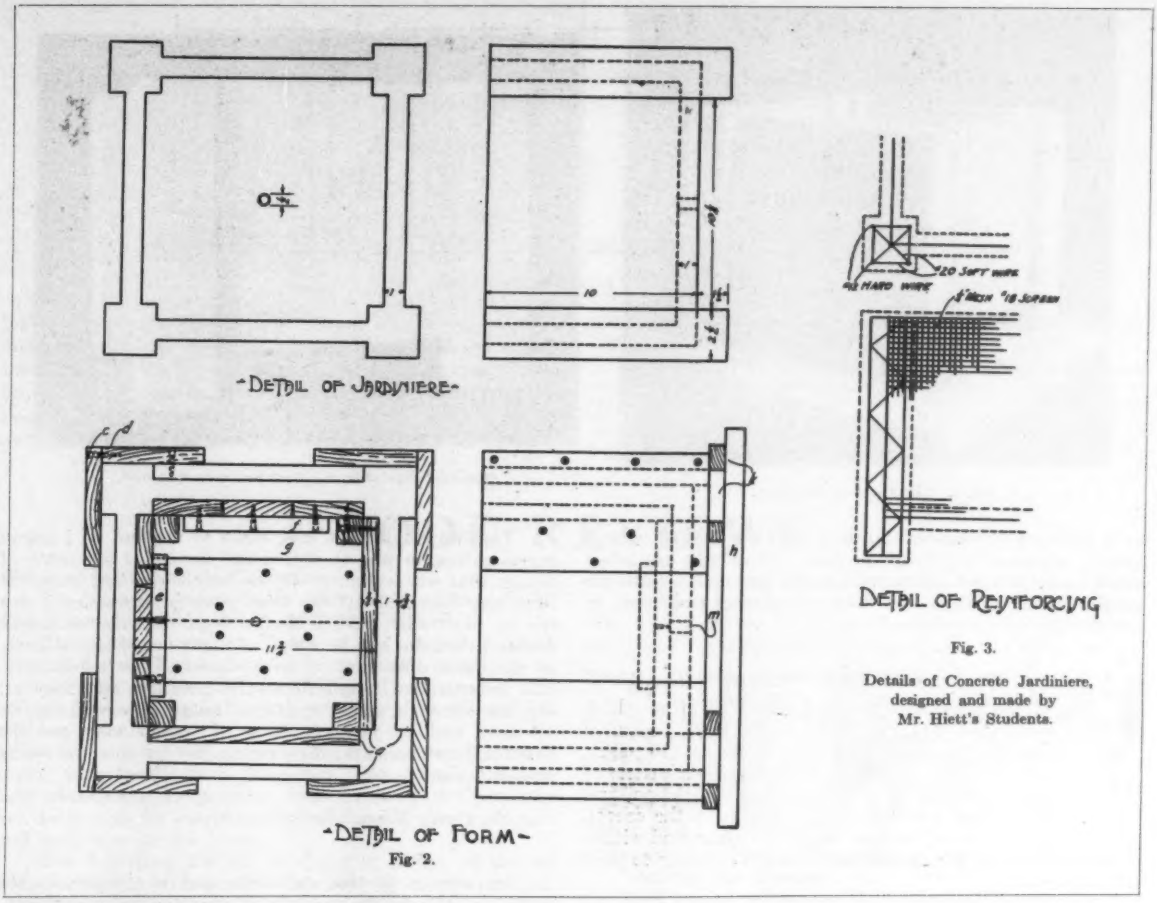


Fig. 2.

Fig. 3.

Details of Concrete Jardiniere, designed and made by Mr. Hiett's Students.

The tension pulley shown at 18 is easily constructed and adds much to the machine. Of course, this machine is most satisfactory when driven from a lathe or some other source of uniform power, but a cheap speed indicator or cyclometer in connection with a watch, will give very good results for comparison.

In using this machine, we constructed many different shaped propellers of a given diameter, connected them in turn to a standard rubber-band motor, which was always wound to give the same number of turns, and found the average time on a stop-watch in which the motor ran down. Then in testing the propeller, we turned the machine at the average speed of the motor, and read the indicator, the test being repeated several times for an average. The results were very interesting in that they helped us to attain longer flights than before and led the boys into a wholesome spirit of investigation.

A machine designed along the same lines for testing the lifting power of wings was tried, but with little success. Its failure, however, seemed to be due to the fact that the wings could seldom be balanced on a tester, the same as on the flying model.

A CONCRETE JARDINIERE.

D. K. Hiett, Cincinnati, O.

THE PHOTOGRAPH, Figure 1, shows the finished jardiniere, and Figure 2, gives the details and dimensions; Figure 3 gives the details of the form used and its erection.

The lumber used is three-fourths inch stock. Thought and some little care should be exercised to keep corresponding pieces to a size. The corner pieces, *c* and *d*, are screwed together as shown, and left so, and all pieces should be marked in some way to aid in re-erection of the form. A slight draft should be left at *a*, to permit of an easy removal of the form from the hardened cement. Two of the inside pieces, *e* and *f*, of the form, should be made in three sections held together as shown so that they may be easily removed. The bottom, *g*, is made in two pieces held together as shown, and is removed after the pieces, *e* and *f*, are taken out. A piece of half-inch dowel is tacked to the bottom at *m*. This forms the drain and is useful in locating the inside of the form. A strip nailed across the top, holds the parts of the form in position during the pouring of the cement. A liberal-sized board, *h*, is used to erect the form on, and blocks, *k*, three-quarter inch high, are fastened on it to form the lower ends of the posts.

All wood pieces should be carefully shellaced or painted to prevent warping. If the grain of the wood is disposed as suggested in the details of the form, little trouble will be experienced with warping.

The reinforcing may be built of iron bailing-wire; or a simple method is to secure some heavy wire screen, of about one-quarter inch mesh, and bend and lace together for the sides and bottom. A few stiff rods may then be wired to the corners of this to fill out the posts.

Various mixes of 1-2, 1-3 and 1-4, have been tried and all give good results. At least a week should be allowed for the cement to set, as it must be poured very wet; and it should be kept moist by a covering of damp cloths while setting. After the form is removed, the surface may be scratched and washed with a mixture of cement and water,

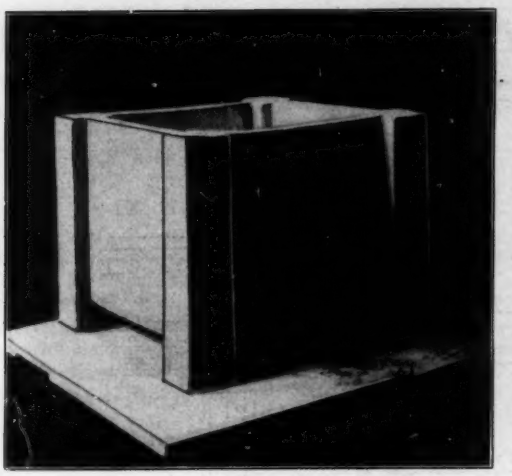


Fig. 1. The Finished Jardiniere.

The Jardiniere after the Mold had been Removed.

or a mixture of cement and sand may be applied with a paddle to give a very rough surface. Those who are interested in color may try fastening tile in various patterns on the inside of the forms, these remaining embedded in the surface of the cement.

THE LANE YEAR BOOK.

ONE of the finest specimens of school printing which we have seen is the 1914 Year Book of the Lane Technical High School of Chicago. This book contains 240 pages, is printed in two colors, contains complete descriptions of the equipment and courses of this unique institution, and was printed, edited, and bound by the boys in the school. As the first edition of the year book was exhausted within a few weeks after its appearance, it was necessary to publish a second.

The printing department of the school has this year been enlarged by the addition of a monotype machine, two linotype machines, and several linotype keyboards.

THE DESIGN OF A PIANO BENCH.

The following letter has been submitted in criticism of a design of a piano bench presented in the September number of the INDUSTRIAL-ARTS MAGAZINE:

To the Editors:

I am interested in your magazine because it has given us practical men what we want, but I was given a shock when your last number came to see under Furniture Design, the design of a piano bench.

The design did not look right to me and so I began investigating to find if it was the design or my sense of design that was at fault. If the bench legs had been left like chair legs without the cross pieces or spreader, I can see no fault with it, but the cross pieces seem to me to demand that the legs be either straight or tapered slightly in the other direction. I have consulted art teachers on this point and a noted furniture designer, and they all say the same thing. Furniture Design is something we all need and let us have more of it, but may not the articles be censored so that we can bet on them as being authoritative?

READER.

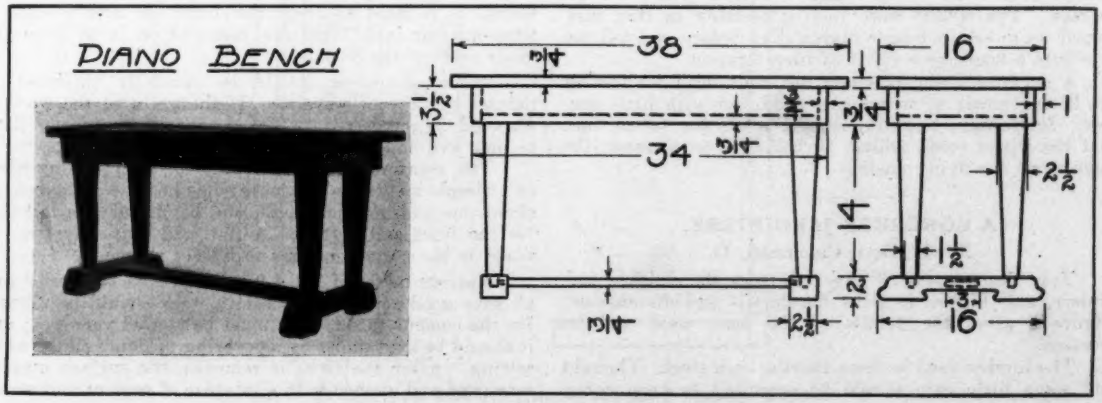
St. Paul, Minn., Sept. 20, 1914.

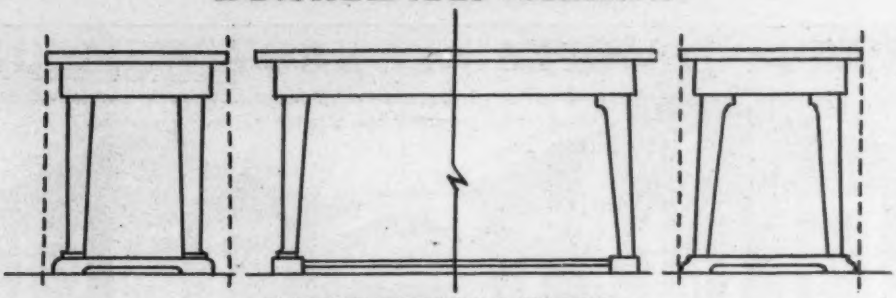
In answer to this criticism and in justice to the author of the design the editors offer the following opinions:

The design is unfortunately presented by the photograph which has been evidently taken with the camera tipped slightly forward, and too near the object; resulting in downward convergence of vertical lines, and excessive convergence of the long horizontal lines.

This exaggerates the taper of the legs to meet the cross pieces, which seem a little too heavy. It would improve the effect of the stool to make the legs vertical, or even spread slightly on the outside corners, because it would avoid the exaggeration of the spreaders or feet.

A little more projection to the sides of the top would also improve the design. On the other hand, if the cross





SUGGESTED DESIGN FOR PIANO BENCH.

pieces had been left off, the design would be ordinary and commonplace. The variety of line attempted in the use of the cross pieces is commendable in contrast to the heavy, square designs common to Manual Training, but such variety must be studied carefully for effect in proportion and profile. Profiles which seem more suitable to the use of a cross-piece, similar to the one in question, are shown above.

NOTE—The Editors of the MAGAZINE will gladly examine, criticise and, if possible suggest improvements in the design of shop problems submitted to them. Unless expressly permitted, the name of no authors of designs will be published. Drawings should be made with black ink on white paper and should be mailed flat or rolled.

BOOK REVIEWS

Elementary Household Chemistry.

By John Ferguson Snell. 300 pages. Price, $1.25. The Macmillan Company, New York, Chicago.

The modern trend in education has created a strong demand for a clear statement of scientific principles as related to the ordinary affairs of life. The author of this volume has undertaken such a statement for the subject of Home Economics.

After a few brief, concise chapters on fundamentals under such headings as Elements, The Atomic Theory, Law of Definite Proportions, etc., the laws of Chemistry are dealt with in connection with the ordinary problems and activities of the home.

The following are the headings of a few of the 43 chapters replete with experiments bearing on the problem of living: Iron, Rust, Hard Water, Commercial Soap, Composition of Foods, Textiles.

The book is a most useful one and will be welcomed by all students of Home Economics.

Crop Production.

By Clarence M. Weed and William E. Riley. 258 pages. Price, 75 cents. D. C. Heath & Co., Boston.

The progress of American teaching methods, especially as applied to the practical subjects of the curriculum, is well illustrated in this book. It is a unique application of the project method to high-school agriculture. The student is given work to do with real things, soil, seeds and plants before he begins serious study of the text.

The book gives the essential facts concerning the history, characteristics, culture, diseases and enemies of the chief crops grown in the United States. It contains about fifty separate discussions about vegetables, fruit, flowers and farm crops. Each chapter is filled with valuable information presented simply and clearly so that students can use the book with interest and profit.

Applied Joinery.

By Louis Caldwell Dewey. 100 pages. Price, $1.25. Published by the Dewey Blueprint Co., Manitowoc, Wis.

This work, which deals with joinery as applied to practical construction, is a loose-leaf book of one hundred blueprints. The problems made use of are those involved in house construction from the simplest framing to the most complicated joinery of door, sash, and stair construction. There is no reading matter except the brief descriptive titles on the plates. The volume gives a large mass of valuable information in a clear, compact, and accessible form.

Course of Study in Manual Training.

Prepared by a committee appointed by the Wisconsin School Arts and Home Economics Association. Issued by the State Department of Public Instruction, Madison, Wis. This report is the result of four years of careful study and investigation on the part of the Committee.

Manual Training in the High School.

By O. A. Hanszen. Bulletin No. 327 of the University of Texas. It is the purpose of this bulletin to supply such information concerning courses of study, equipment, space required, etc., as is needed by superintendents organizing departments of Manual Training; also to indicate the best lines along which to develop and improve the course of study and instruction.

A Report on a Plan of Organization for Co-operative and Continuation Courses.

By Herman Schneider, University of Cincinnati. Department of Education, City of New York. This Bulletin is the recommendation of Dean Schneider to the Board of Education of New York.

The principal recommendations are: "That a Bureau of School Operation, practically autonomous in its operation, be established with a director in charge, and that a Managerial System of Organization subject to basic legal requirements be adopted."

"That the rules governing the details of operation of the present school system shall not apply to the Bureau of School Co-operation, so that the new bureau may be free to devise operating mechanism to meet its needs."

Second Annual Report

Of the Industrial, Continuation, Commercial and Evening Schools of the City of Beloit, Wis. Published by the Local Industrial School Board. Describes the work done in the schools together with a financial statement of its cost.

Report of the Commission on National Aid to Vocational Education.

Two volumes. House of Representatives, Document No. 1004, 63d Congress, 2d Session. Volume 1 contains the Report of the Commission together with the proposed laws. Volume 2 contains a stenographic account of the hearings before the Commission.

Present Status of Drawing and Art in the Elementary and Secondary Schools of the United States.

By Royal Bailey Farnum, State Specialist in Drawing and Handwork for New York. United States Bureau of Education, Bulletin No. 13, 1914. Three hundred and seventy-five pages and 63 plates showing photographs of work done in representative schools of the United States. An exceedingly interesting and instructive bulletin.

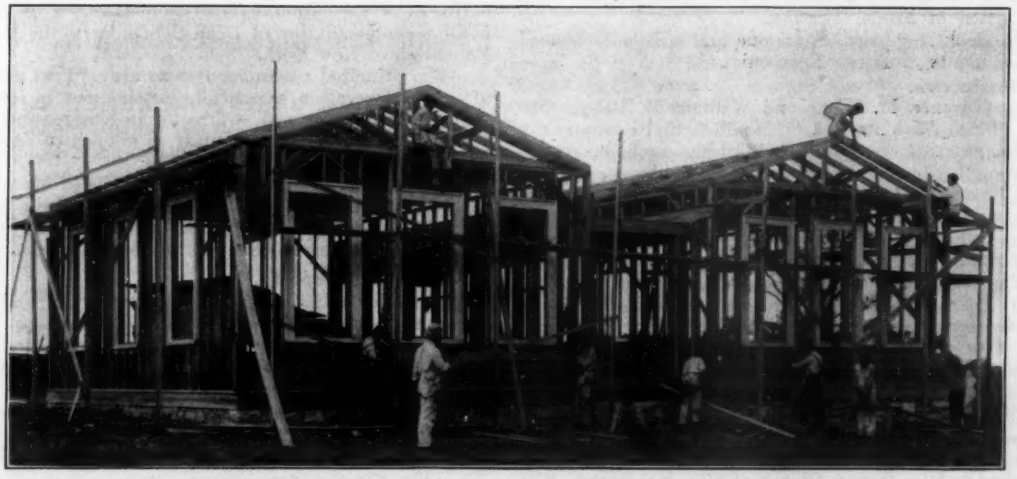
BUILDING ERECTED BY KANSAS CITY MANUAL TRAINING STUDENTS.

The above two-room, temporary annex building was erected last summer at 75th and Tracy Streets, Kansas City, Mo., for the board of education, by a class of eight boys in carpentry, under the direction of Mr. C. W. Davis, carpenter teacher.

The boys in this class had previously erected another building of the same type at the Sanford B. Ladd School and, therefore, had gained the experience necessary to make greater progress in this second building. The time consumed in the erection of this building was 1,608 pupil-hours, with 26 days for the teacher's time. The average age of the boys was 16.87 years, and they received 20.15 cents per hour average wage. The total cost of this building was $2,291.42.

It is a remarkable showing in the contrast of these two buildings, inasmuch as the time consumed in pupil hours on the second building was less than two-thirds of the time consumed in the first building. These buildings are sealed upon the inside and no plastering is necessary. This makes it an excellent project for vocational work in carpentry. The boys, in the erection of this building, were selected as much as possible from applicants who desired to work for the purpose of fitting themselves for woodworking trades, architectural drafting or building trades.

The photographs are reproduced by courtesy of Mr. J. C. Wright, Director of Vocational and Manual Training Instruction, Kansas City Schools.



TEMPORARY SCHOOL BUILDING IN COURSE OF ERECTION.

This two-room, temporary frame annex building was similarly erected for the board of education of Kansas City, Mo., and is located at the Sanford B. Ladd School, 37th and Walrond Streets.

The carpentry work was done by a class of ten boys, in 2,525 pupil-hours, under the direction of Mr. C. W. Davis, carpenter teacher, whose time was 32.5 days of eight hours each.

The total cost of the building was $2,296.83. The average wage of the boys, per hour, was 14.48 cents, with an average age of 16.22 years. The building was painted, inside and out, by the class in painting, under the direction of Mr. J. H. Hunt, painting teacher, at a total cost of $41.44 for labor, and $41.53 for material. The average age of the boys in the painting class was 15.87 years and they were paid an average wage of 16.37 cents per hour.

THE NEW YORK VOCATIONAL SURVEY

Summary of the Report of the Vocational Education Survey to the Sub-committee on Vocational Guidance of the Committee on High Schools and Training Schools of the Board of Education.

The Purpose of the Survey.

The purpose of the Survey is to develop for *all* children between 14 and 16 years of age a practical method of pre-vocational (industrial) education which shall be based upon a thoro practical knowledge of the demands of industry, shall be consistent with democratic educational ideals, and shall be financially practicable for New York City.

The Field of the Survey, and Reasons for Its Choice.

It is important to emphasize that this Survey is concerned *primarily* with the study of the problem in vocational education hitherto most neglected, i. e., the *prevocational* training of all 14-16-year-old children in school.

1. *Phases of Vocational Education With Which the Survey is NOT Concerned.*

The Survey is *not* concerned with (1) specialized "trade training" of 14-16-year-old children, or with (2) technical high-school training for a comparatively few 14-16-year-old children, nor even with (3) co-operative and continuation school training of 14-16-year-old children *after* they have left school.

Desirable as most of these three forms of vocational education may be, they do not, in our opinion, touch the fundamental, democratic educational problem of the great mass of 14-16-year-old children who now leave school for work.

(1) *Specialized trade training* of children between 14 and 16 years of age for special trades we believe is neither educationally sound nor financially practicable for all children, nor ultimately for the best interests of industry and the workers.

(See report upon "Vocational (Industrial) Schools," by Dr. Herman Schneider, p. 29, par. 1.)

(2) Technical high schools for 14-16-year-old children are out of the question for *all* such children because of the expense involved, nor do such high schools aim to prepare pupils for any except the *advanced* positions in industry.

(3) The co-operative and continuation school plan for children *over* 16 constitutes, in our opinion, the greatest contribution to the problem of vocational education of children *over* 16 yet offered, but it does not solve the problem for children *under* 16 for the following reasons

(a) If, by *co-operative* schools we mean the co-operative plan of education between the school and "skilled" or "energizing" industries, as defined by Dean Schneider, such schools cannot touch more than a fraction of the whole number of 14-16-year-old children, because, as a general rule, the skilled industries will not employ children *under* 16.

(b) The continuation school, on the other hand, altho it reaches more children, must necessarily be palliative rather than constructive in its work for *children under* 16. To explain:

Dean Schneider defines continuation schools as follows: "The whole problem of the continuation schools is careful planning of the mental instruction so that it will best *supplement* the work done in the commercial shop. It will be evident that this mental instruction must vary widely for different trades, and must depend primarily upon how energizing or enervating the shop work may be. . . . . As the work of (an) occupation . . . . becomes more enervating, the supplementary school instruction would not be the same as that in the energizing job. . . . . In certain high speed or repetitive processes the instruction would be planned solely to counteract the lethargizing tendencies of the work itself."*

Investigation in New York City has shown that these *enervating* industries are the only ones that the majority of children under 16 can enter.

Therefore it is evident that instruction in continuation schools for children *under* 16 in New York City must be "planned solely to counteract the lethargizing tendencies of the work itself."

Such schooling is certainly an improvement over *no* part-time schooling, but, as pointed out above, it is *necessarily* palliative. It makes the best of a bad situation, but it is not constructive industrial education for children *under* 16.

* See Report upon "Vocational (Industrial) Schools," Dr. Herman Schneider, p. 37.

2. *The Phase of Vocational Education Which the Survey Has Undertaken to Study and Reasons for the Choice.*

The Survey, as pointed out above, is concerned *primarily* with the study of *prevocational training of all* 14-16-year-old children in school. This particular group of children was chosen because,

(a) Vocational training for children of this age is the most *pressing* problem in vocational education, since,

(1) Fewer opportunities for industrial education are offered children *under* 16 than to any other group of children in school or in industry. Out of 40,000 children who leave school for work annually at 14 years of age, public vocational education is provided for only 2 1-7 per cent.

(2) This particular group of children stands in the greatest need of industrial education since *the majority become industrial workers.*

(b) Vocational education for children of this age is the most *difficult* problem in vocational education since,

(1) As pointed out above, types of vocational education that have been worked out for children *over* 16 do not apply to children *under* 16, because of the immaturity of such children and the incompatability of *their* needs and of the demands of industry.

(2) Plans for the vocational education of children under 16 usually come to a standstill because of the apparent incompatability between the practical demands of industry and the educational needs of the children. The dilemma can be stated briefly as follows:

It is evident that to prepare children under 16 for subdivided processes of work or special parts of a trade is neither educational for the children, financially practicable for the schools, nor ultimately for the best interests of the workers or of industry.

It is equally evident that *industry wants workers on subdivided processes.*

The question then is—how are we going to train children in a way that is *practical*, and yet in a way that will not so narrow them as to injure their possibilities of becoming *increasingly* efficient workers?

(c) The Vocational Education Survey believes it has a solution for the dilemma just mentioned.

(1) We grant the incompatability between the educational needs of children under 16 and the *immediate* practical demands of industry. But we do not grant the incompatability between the educational needs of children under 16 and the demands of society and of industry for a supply of workers who will be *continually* efficient, who will have the ability to keep pace with changing conditions in industry.

But if workers are to be continually efficient, if they are to keep pace with changing conditions in industry, it is evident that they must have the *ability to adapt* from one specialized process to another.

But *ability to adapt* must be based on broad training and understanding of the principles underlying the various specialized forms of work. The industrial worker needs such background knowledge as much as the professional man if he is to keep his footing in changing industrial conditions, and industry needs such background knowledge from its workers if is is not to be flooded with inefficient workers who are the products of its own premature and excessive specialization.

(2) We believe, therefore, that, if the schools are to train workers who are to be *continually* efficient, *it is important to lay the foundation of such training with children under 16 by teaching them the fundamental principles that are common to many trades*, rather than to teach them only one trade or process which may have disappeared five or ten years after such children leave school.

This plan is practicable because

All specialized machines and processes have come from certain simple forms.

Specialization represents *variation in principle* of these simple forms.

This variation is due to the demand for different kinds of products.

(3) We believe, therefore, that it is of *practical impor-*

tance for schools to make a first-hand *detailed* study and analysis of actual processes in selected industries, in order to determine what are the fundamental principles common to the various types of industrial work, together with their variation according to different products.

Such analysis should give conclusive data as to the fundamental industrial training that is needed if workers are to become increasingly efficient.

The Plan of the Survey for the Coming Two Years.

The plan of the Survey for the coming two years is to study and collect facts about the *metal industry*, which comprises 41 *different industries*. This industrial group was selected because

(1) It employs more men than any other industry group in New York City (i. e., 100,000), or about 1-6 of the total workers (641,703) engaged in all the industry groups of New York City.

(2) The dominant work of the metal industries—the making and operating of machines—is basic to all industry. Therefore, more than any other, a study of the Metal Industries should throw light upon other industries.

(3) It is one of the industries which most obviously has educational content.

It is proposed to carry out this plan by means of intensive investigation and study in order

(1) To determine, a, The number and percentage of the 100,000 employes engaged in each of the several types of machines and handwork.

b. The particular character of each of the several classes of machine and handwork.

c. The variation of work in each of the several classes according to the product.

(2) To *analyze* the machines and processes in order to determine the fundamental principles which are common to machines and processes of the several varying types, with a view to determining how these principles can be taught to children under 16 so that the children can adapt more readily to the special kinds of work that they will take up after 16.

Such a study of the demands of industry *has not been made* for New York City schools.

It is important that such a study be made at once because:

The cost of instruction for day vocational education for 1914, $140,648.47, points to an increase of 67.7 per cent over expenditures for day vocational instruction in 1913.

This growth in the cost of vocational education will undoubtedly continue.

A *survey of facts* is the only efficient and economical method of developing this expensive form of education.

Up-to-date manufacturing firms consider it good business today to spend large sums of money to ascertain what is the *demand for a certain product*, and whether they can meet that demand with profit to themselves.

If schools are to realize the full value of the city's money appropriated for vocational education, they should ascertain by just as *thoro scientific methods*—

What is *demanded of workers* in New York City.

How the schools can meet this demand with the greatest educational profit; i. e., how they can develop a system of education for children between 14 and 16 which will be *most useful to the children*, and how they can do this for the *largest number of children at the lowest cost to the city.*

(3) *To make an experiment* in prevocational training in one elementary school in Manhattan based on the findings of the Survey to date. All plans for the experiment must be subject to the approval of a committee appointed by the Board of Education to supervise the Survey. It is, however, the personal opinion of the Director of the Survey that the experiment would be most profitable and practicable if it were carried out along the lines developed in Gary, Indiana.

Summary.

We stated in the beginning that "the purpose of the Survey is to develop for *all* children between 14 and 16 years of age a practical method of prevocational (industrial) education which shall be based upon a thoro, practical knowledge of the demands of industry, shall be consistent with democratic educational ideals, and shall be financially practicable for New York City."

We are convinced that the plan of the Survey is calculated to give those results. Our conviction is based not merely upon belief in the *plan*, but on a year's *actual work* of investigation according to the plan outlined in the full report.

From data and results already obtained, we know that the Survey will give (1) A method of prevocational (industrial) education for children under 16 based upon an analysis of the industry which is most basic to all industrial work.

From the indications of the past year's work, the Survey believes that prevocational training could be carried on for 14-16-year-old children in the *present elementary* schools in the city at *much less cost* than would be necessary if *special* vocational schools had to be erected.

(2) Data for the practical working out of continuation school work, in the industries studied, for children between 14 and 18 already at work.

The success of continuation school work will depend upon whether or not the school has a practical knowledge of the processes and conditions of work in the industries with which the continuation school is to be carried on. As President Churchill has said in his report, "continuation classes should be established during the day. . . . . Day continuation instruction, moreover, will require a much closer degree of co-operation with the organizations of employers as well as with labor unions."

The Survey will be able to furnish the concrete information about the industries studied which is necessary to make such co-operation profitable.

(3) *An exact, detailed classification of occupations* in the industries studied.

Such a classification *has not been made.*

Such a classification is necessary as a basis for a *continuous census* of occupations in New York City.

A continuous, up-to-date census of occupations is necessary if the labor supply is to be adjusted at all to the demand.

Alice Barrows Fernandez,
Director.

June 20, 1914.

PROMOTE INDUSTRIAL EDUCATION.

The Public Education Association, of Philadelphia, is actively promoting evening, industrial and continuation schools for young men and women in the industries. Posters have been placed in all of the large manufacturing establishments and libraries of the city, and folders giving detail facts about the public and private night schools of the city have been printed and distributed. Combined advertising in the newspapers has been done by the Association, thru its Industrial and Technical Education Conference.

During the past winter, a series of lunches was held under the auspices of the Conference to bring the industries and the schools in closer contact. A series of similar luncheons has been planned for the coming winter and the various aspects for the training of the child, for, and in an industry, will be considered by both employers and schoolmen. It is stated that the Conference will shortly undertake a survey of the opportunities in Philadelphia in the various trades, the qualifications necessary to enter them, and how and where desired training can be obtained.

CONFERENCE ON TRAINING TEACHERS.

The United States Commissioner of Education has called a conference of specialists in charge of Departments in State Universities, Normal Schools, and other institutions, for the training of teachers for vocational schools, and presidents or directors of such institutions, to be held in connection with the 1914 Annual Convention of the National Society for the Promotion of Industrial Education, Richmond, Va. The conference will be held, by invitation, in the rooms of the Richmond Business Men's Club, Friday evening, December 11th. The conference will be preceded by an informal dinner at 6 p. m.; tickets, $1. Application for copies of the program of the conference, and cards of admission, should be addressed, before December 1st, to W. T. Bawden, U. S. Bureau of Education, Washington, D. C., who is in charge of the arrangements.

BRIEF ITEMS OF INTEREST

SUPPORT OF THE WISCONSIN CONTINUATION SCHOOLS.

THE 27 cities of Wisconsin which maintained continuation schools, during the year 1913-14, spent a total of $290,744.62 for this form of educational effort. The enrollment in the schools was 26,954, being an average of one child for every thirty persons in the cities maintaining them. The highest enrollment, per capita, was in West Allis, an important industrial suburb of Milwaukee, where one in every fifteen attended the school. The total state aid to these cities was $93,833.95.

The cities which conducted continuation schools last year are: Appleton, Beaver Dam, Beloit, Chippewa Falls, Cudahy, Eau Claire, Fond du Lac, Grand Rapids, Green Bay, Janesville, Kenosha, La Crosse, Madison, Manitowoc, Marinette, Marshfield, Menasha, Menomonie, Milwaukee, Neenah, Oshkosh, Racine, Sheboygan, South Milwaukee, Superior, Two Rivers, Wausau, West Allis.

Under the present state law, nineteen cities in addition to the 27 mentioned above, may receive state aid for continuation schools. From present indications it is safe to say that practically all cities in the state will have continuation schools within the next year.

BRINGING SCHOOLS AND INDUSTRIES TOGETHER.

MEANS of bringing the elementary schools closer to the industrial life of our communities were discussed at a recent gathering of Utah superintendents in Salt Lake City. Dr. Milton Bennion, Dean of the College of Education, University of Utah, in leading the argument suggested four immediately available administrative changes in the schools. He said in substance:

"Among the various means of bringing about a closer relationship between the schools and the industrial life of the communities in which they are located, I suggest the following:

"1. A readjustment of the school calendar to better fit the industrial life of each community. This may involve shorter and more frequent vacations. In a sugar-beet growing district, for instance, there might be beet harvest, beet planting, and beet thinning vacations of about two weeks each; or, in each of these cases, the change might be from a whole day session to a half-day session, instead of a complete vacation. This half-day session might, at this time, be devoted exclusively to the most essential scholastic studies, all industrial subjects being suspended during the period when the older pupils are working half-a-day. In cities where boys have little to do, the vacation months might well be utilized for half-day sessions in industrial subjects and supervised athletics.

"Thus two sorts of flexibility might be sought; i. e., flexibility in the program of studies and in the school calendar. We have sought uniformity at the expense of adaptability. We need, now, to adapt the school to the local situation, even tho this may involve great diversity within the same school system.

"The expansion of school credits to include credits for home work seems to be a move in the right direction, provided the home work thus credited is subject to school inspection and that the credit thus given is supplementary to, and not a substitute, for the regular work of the school. This credit should cover all vacation activities, including private lessons in music, art, and hygienic living, as well as industrial subjects. In order that this work may be properly supervised or inspected, principals and supervisors should be employed twelve months in the year.

"2. A readjustment of the use of state funds for elementary schools. Instead of distributing state elementary school funds on the basis of school population, the state might, out of this fund, pay one-half or more of the cost of equipment for industrial work in schools, including lands purchased for agricultural or school-garden purposes; also, payment of a percentage of the salaries of supervisors of industrial subjects, and principals of rural schools, who may be qualified to supervise the industrial work of the school. These payments would require the establishment of standards of efficiency as a condition of state aid. After all such payments have been made the remaining portion of the state fund might be distributed on the basis of school attendance.

"3. The employment of teachers who better understand and sympathize with the industrial life of the community in which they live. The theory and practice of Household Arts is more important than a foreign language as a part of the preparation of young women to teach in the elementary school. Young men, likewise, entering upon this service need both theoretical and practical knowledge of the industrial life of the community in which they teach. Normal Schools should see that these conditions are met as nearly as may be.

"4. Make the position of principal of a rural school practically a life's work for a man of suitable training and ability, that he may be a prominent factor in the life of the community, and himself participate, in some measure, in the industrial affairs of the community."

THE WELDING OF IRON AND STEEL.

Editors, Industrial-Arts Magazine:

In the October number the undersigned notices a query concerning the proper heat for welding.

The best heat for welding is reached when the iron begins to fuse and drops of metal begin to run off the ends of pieces to be welded. Any heat below that is liable to produce an imperfect weld, which means a weld having less than 85 to 90 per cent of the strength of the metal in its unwelded portion. Good electric welds should have a strength of from 95 to 100 per cent of the strength of the solid bar.

The reason for heating the surfaces to be welded to the point of fusion is this: Iron, or steel, which is in a state of fluidity be it in the furnace, crucible or puddling furnace, is in a maximum state of homogeneity. That is to say all the elements of which the metal is composed are uniformly distributed thruout the mass and each molecule is free and unhindered to circulate between and thru the surrounding molecules.

If, when the iron or steel cools and solidifies, the various elements would remain as uniformly distributed in the cooling mass as they were distributed in the fluid mass; and if the molecules would group themselves uniformly into crystals of uniform size and shape and these crystals again would be uniformly distributed, not more at one place than at another place, then we would have an ideally homogeneous metal, of uniform strength and highest degree of quality. Both the producer and consumer would then be relieved of many trials, and troubles, difficulties and vexations which are constantly encountered while producing and using iron and steel. But in the solidified, hammered or rolled bar of iron or steel there is no such uniformity and homogeneity as there was in the fluid metal and this has to be borne in mind in welding.

In wrought iron there are from 95 to 98 per cent iron, from 1½ to 3½ per cent of slag, or "cinder", from 0.04 to 0.07 of one per cent of carbon, a little sulphur, a little phosphor, a little silicon, some oxide of iron and perhaps traces of other elements. In the solidified iron, part of these elements are combined chemically with the iron, part of them is in the slag, some may be free and lodged

between the faces of the crystals. More of the one than of the other will be found in different sections of the metal. Sometimes several of these elements will be "bunched," forming a nest. The same diversity will be found with the crystals which will not only vary in size and hardness but also are liable to form in nests of greater or less density. Nor will the slag, or "cinder" be uniformly distributed; it will be present in streaks, veins and nests. This then is the condition of the average wrought iron when one begins to weld two pieces together.

Welding means to so unite two separate pieces of iron that, after having been welded, one solid homogeneous bar of metal will be the result, theoretically as strong thruout as the solid bar was, but practically possessing only from 85 to 90 per cent, in the best welds, of the strength of the bar. Now then, if uniformity of distribution of elements in the iron and mobility of molecules produces the ideal metal in the fluid state we must, in welding, produce these conditions as near as is possible. In other words, we must bring the surfaces to be welded to as near the ideal condition which the metal possesses in the fluid state as is possible without destroying the solidity of the metal. Thus, the various elements of which the metal is composed must be brought back to a sufficiently high state of uniformity and mobility so as to allow as nearly an intimate a union and interchange of the molecules, and uniform distribution of elements as when the metal was in its original fluid state. But since this state cannot be reached without destroying the metal we do not obtain 100 per cent strength in the weld.

To the degree then as we heat the surfaces to be welded, to near the point of fusion, to that degree the weld will be a success; always provided the surfaces were clean, that is, free from oxides, or sulphur, or smoke from the fire.

Sulphurous coal is the worst foe to a good weld, hence the necessity of a well burnt and clean fire for welding. Not only is there sulphur in the iron itself, but it will greedily absorb sulphur from the coal, or coke, so long as the fuel is not thoroly aglow. The presence of sulphur is indicated by a yellow-greenish color of the surfaces to be welded. In that case the surfaces will only stick together but will not be united.

A pinch of clean river sand, free from loam, or powdered glass thrown on the surfaces to be welded, while the iron is still in the fire, will help to cleanse the surfaces. It will also serve as a flux for better welding tho the slag in the iron, which in itself is a glassy substance being composed chiefly of silicious matter, will perform the function of a flux.

Hence the further necessity in heating the metal to heat it high enough to bring the slag to a fluxing condition. The matter which drops off on heating the iron to a welding heat is to the smallest degree iron but mostly the slag or "cinder" contained in all wrought iron, and the presence of which is necessary to make the iron fibrous. No fiber can be present without slag in the iron. If steel is to be welded, a process which the amateur better not attempt, borax should be used as flux since steel contains no slag whatever. If it does contain slag it is bad steel under any circumstances.

In welding for purposes, in which the welded material is to be used for actual service bringing its strength and durability into play, it is of vital importance to have a sufficient surplus amount of metal in the ends to be joined, as well as some distance beyond the actual welded portion; allowing for reduction, by hammering of the heated portion, to the size desired. The reason for this precaution is this:

The welding heat produces large crystals at the point to be welded and in addition changes the structure of the metal on either side of the weld until that portion is reached which was not affected by the heat. If there is not enough surplus metal provided for at, and beyond, the weld to break up the coarse crystalization, thru forging, produced by welding, then the heated part will be weaker than the already well worked bar, since coarse crystaline metal is weaker than metal with fine crystals, and thus the bar at the weld will be weaker; first on account of the weld, and second on account of coarse crystalization due to lack of material to induce the fibrous condition which the bar of iron possessed before welding. But supposing there was enough surplus material at the weld to reproduce the original fibrous condition of the bar before heating, the zone of metal between the weld and the portion of the bar on either side, which was not affected by the heat would remain in a more or less disturbed condition, due to the heating having changed the structure; and these two zones would remain weaker than either the welded portion and the portions of the bar not affected by the heat.

L. C. DEWEY,
Director of Manual Training, Dallas, Tex.

In order, therefore, to eliminate these disturbing effects upon these two zones, the whole bar should be annealed to a red heat which, after cooling, will leave the bar in a uniform condition of strength and ductility. The writer has taken the trouble of explaining these various stages because in a good schoolshop not only emphasis should be laid upon the acquisition of mechanical skill but even more so upon the learning of the reasons why.

Paul Kreuzpointner.

Altoona, Pa., October, 1914.

NOTE—The writer of the above letter was for nearly thirty years chief of the Testing Department of the Pennsylvania Railroad. He writes with the most intimate knowledge of iron and steel working processes and of the causes of defects and failures.

MR. DEWEY TO DALLAS.

Mr. Louis Caldwell Dewey has been appointed Director of Manual Training at Dallas, Tex.

Mr. Dewey has, for three years past, directed the Manual Arts Department at Manitowoc, Wis., and has had charge of the Continuation Schools in that city since their establishment. He is a graduate of Purdue University and has had many years' experience as a teacher and as a mechanical draftsman and machine designer.

Mr. Dewey is the author of the Wisconsin State Course of Mechanical Drawing for permit continuation schools. He is, also, the author and publisher of a considerable number of mechanical drawing problems for school use.

NEW YORK, N. Y. Five public schools have been designated by the school board for experimental vocational training. The municipal authorities have announced that an appropriation of $250,000 will shortly be available for the beginning of the work.

GENERAL NEWS NOTES

NEW YORK, N. Y. The Director of Drawing for the public schools has suggested to the board of education that special evening classes be organized for the instruction of class teachers in the subject of drawing. A sufficient sum to cover the expense of the work is to be included in the budget for the ensuing year.

DAVENPORT, IA. A course in Printing has been established in the high school under the direction of Mr. S. P. Willett.

FERGUS FALLS, MINN. A 3-story building accommodating the agricultural, domestic science, commercial and normal departments is nearing completion.

THE MILWAUKEE CONTINUATION SCHOOLS gave instructions to 6,914 students during the year, 1913-14; the industrial school to 727 students, and the evening schools to 5,535, according to the report of the Wisconsin department of public instruction.

The night school records show the following classification of students: 386 clerks; 722 mechanics; 179 telephone operators; 420 waiters and servants; 249 housewives; 496 factory workers; 62 dressmakers; 42 tradesmen; 16 teachers; 84 draughtsmen; 40 printers; 2,492 miscellaneous workmen.

The total expense of the apprenticeship school was $9,835.89. The cost of the continuation school was $66,-183.70.

BENTON HARBOR, MICH. A building devoted exclusively to the departments of Manual Training and Domestic Science has been added to the equipment of the public schools this year. The building, which is of brick-and-stone construction, is two stories in height. The first floor will be used by the Manual Training Department; the second by the Domestic Science and Mechanical Drawing Departments. The interior finishing of the building is being done by the students of the Manual Training Department under the supervision of Mr. M. J. Dunkirk who is also the designer of the building. The building when complete will cost $12,000.00.

THE school board of Benton, Me., has entered into an agreement with the board at Fairfield, by which the latter will provide accommodations for the grade pupils in Manual Training and Domestic Science.

IRON MOUNTAIN, MINN. Manual Training and Domestic Science have been introduced in the West Virginia and Leonidas schools.

ROCKFORD, ILL. Manual Training work has been extended by the addition of a course in the sixth grade.

PHILADELPHIA, PA. Additional Manual Training Shops have been added in twelve elementary schools, making a total of 42 in the entire school system.

LOS ANGELES, CAL. A course in expert dressmaking has been inaugurated at the Polytechnic High School. The class comes under the head of special courses, and students taking the course are required to study only subjects related directly to trade dressmaking.

ST. CLOUD, MINN. Larger accommodations have been provided for classes in Agriculture and Domestic Science.

SAN JOSE, CAL. A Manual Arts Department has been opened in the high school and machinery valued at $3,500 installed. A Department of Agriculture has, also, been opened under the direction of Mr. Frank Edwards, formerly at the Polytechnic School, San Luis Obispo.

ALAMO HEIGHTS, TEX. State aid, in the amount of $1,000 has been granted the board of education for the enlargement of the domestic science and manual training departments. To this has been added a similar sum by the school district.

MOLINE, ILL. Continuation school work has been resumed under the direction of Mr. Truman Jones, who for the past three years has supervised the classes. Sixty-six of the seventy boys, enrolled during the last year, have returned to the classes, and the places of the others have been filled by six new apprentices from one of the manufacturing plants.

The apprentices are divided into sections of ten students each, and are given practical instruction in shop mathematics, mechanics, mechanical drawing, shop English and other subjects according to the preparation of the student. With the completion of the four-year course in school and shop the students are certified as graduates of the trade course.

ROCKFORD, ILL. Recent reports from the respective schools of the city show that 1,109 boys in the high and elementary schools have elected manual training for the first term. Domestic science was chosen by 1,113 girls.

KANKAKEE, ILL. A Department in Domestic Economy has been opened in the high school. The classes have begun with cooking and sewing. The Manual Training Department, owing to over-crowded conditions, has been moved to larger rooms in the high-school building.

STURGEON BAY, WIS. A course in Domestic Science has been introduced for the pupils of the sixth, seventh and eighth grades and the high school. Miss Florence Rilling is in charge.

PEORIA, ILL. The enrollment in manual training classes in the high school for the year 1914 is 560, or an increase of 85 in that department.

SCHUYLKILL, PA. The Schuylkill Seminary opened with an additional course in Domestic Science under the direction of Miss Priscilla Bock. Evening classes have been arranged, with sessions from 7:30 to 9:30.

DURHAM, N. C. A four-year course in Manual Training for boys, and a similar course in Domestic Science for girls, have been introduced in the high school.

ALBANY, N. Y. The attendance in evening classes during the past year was 50 per cent higher than that of the previous year. This has been attributed to the interest in vocational courses offered in the schools.

TAMPA, FLA. A building to be used as a model school in Domestic Arts and Sciences is in process of erection. It will cost about $2,000 and will be equipped with all the latest appliances, including gas and electric ranges.

AMARILLO, TEX. A course in cooking and sewing has been inaugurated for the junior and senior students in the high school.

KENOSHA, WIS. The continuation schools opened with an attendance of more than four hundred all-day students and more than one hundred permit-working students.

WAUSEON, O. Manual Training and Domestic Science have been introduced under the direction of Mr. Charles Snell and Miss Carrie Clifton.

MALDEN, MASS. A course in household arts has been inaugurated in the high school.

A COURSE in Agricultural Engineering has been opened at the Kansas State Agricultural College at Manhattan. The course is four years in length and covers farm machinery, irrigation or drainage engineering, and flour milling. The work is an addition to the professional courses in architecture and in civil, electrical and mechanical engineering.

PAWNEE, ILL. The Pawnee Township High School opened in September with additional courses in household science and manual training under the direction of Miss Elsie Gildersleeve and Mr. J. W. Borgarding, respectively.

FRANKFORT, KY. Classes in cooking, sewing and basketry, have been organized at the Wilkinson Street School. Regular teachers of the respective grades are in charge.

OAKLAND, CAL. The Piedmont Avenue School has been reorganized for departmental work in the sixth, seventh and eighth grades. Elective subjects include drawing, manual training, cooking or sewing, and copper work.

DADEVILLE, ALA. A Department of Domestic Science has been introduced in the Tallapoosa County High School, under the direction of Miss Barker, of Birmingham. A similar department has, also, been added in the grammar school.

TOWER, MINN. Sewing has been introduced in the Tower-Soudan public schools.

CANDO, N. D. A Printing outfit has been installed in the schools. Arrangements have been made for the printing of report blanks and other printed matter needed by the various departments of the school system.

STATE SUPERINTENDENT CHURCHILL of Oregon has announced the early distribution of courses of study in Agriculture for the eight grades of the public schools. It is intended, in the future to teach the subject thru a combination of textbook study and practical demonstrations. Special stress will be laid on gardening in an effort to make every child acquainted with the subject.

BELOIT, WIS. Day classes for boys and girls have been opened at the Industrial School.

THE FIRST AGRICULTURAL HIGH SCHOOL in Cook County, Illinois, is shortly to be erected at Arlington Heights. A ten-acre farm site has been obtained and bonds will be voted for the erection of a building.

STERLING, ILL. The Manual Training Department of the high school has been extended in scope by the addition of a Mechanical Drafting Department.

SUPERIOR, WIS. The high school offers a new course in chemistry of foods in connection with the study of Home Economics.

SIOUX FALLS, S. D. To enable students to become practical, economical housekeepers, the Washington high school has introduced a Household Art course. One year in sewing and a half year in household management are provided.

SUPERIOR, WIS. A printing press has been installed in the high school and an elective course in the subject provided. Mr. Harley Goodwin has charge of the classes.

NEW YORK, N. Y. A practical course for printers has been opened at the Stuyvesant Evening High School. Sessions are held four evenings each week from 7:30 to 9:30 o'clock.

NEW BEDFORD, MASS. The New Bedford Textile School reopened with an enrollment of twenty students. It is believed that fully fifty regular day students will be enrolled at the school this year, and that a larger number from the immediate vicinity will take advantage of the classes.

IN accordance with a plan adopted last year, Pratt Institute has reopened its classes for experienced trade workers who desire to become instructors in machine work, carpentry, cabinetmaking, patternmaking, electricity, sheetmetal work, printing and machine drafting.

Each applicant is interviewed by the teacher in charge and must present his qualifications showing him to be a first-class worker in his chosen trade; he must be in good health and preferably not more than 35 years of age. He must also be able to teach and to handle boys successfully.

Classes are arranged so that a man may study and at the same time continue at his work. Sessions are held three times each week, with hours from 7:30 to 9:30 each evening.

DAYTON, O. A co-operative school has been opened at the Stivers Manual Training School with an enrollment of fifty boys.

SELMA, CAL. The Manual Training Department has been remodeled and enlarged, providing accommodations for a class of seventy students.

DETROIT, MINN. Forge work has been added in the high school.

DR. GEO. W. GERWIG, Secretary of the Pittsburgh School Board, has made a report on industrial and continuation schools as he observed them during the past summer. The report shows in what respect the German system of industrial training is superior to that of any other country. It summarizes the situation by saying that we must add to the present shop training some proper school training, and add to the present school course some practical work in the shop.

LAUREL, WASH. Two years of industrial training are offered in the high school in addition to the regular subjects. Classes in cooking and sewing have been opened under the direction of special teachers.

KANSAS CITY, MO. Under the direction of the Supervisor of Domestic Science, a series of laundry lessons have been arranged for girl students in the second year of the high school. In the past, general instruction has been given, and it is the purpose this year to give more practical work.

CANTON, O. The students of the Manual Training Department of the high schools have recently undertaken the construction of furniture for the two new buildings nearing completion. The equipment includes tables, square desks, furniture for restrooms, and sewing and shopwork departments at the Central and North High Schools. It is believed a saving of $1,000 will be effected.

CHICAGO, ILL. Thirty-six schools have been opened for special evening instruction. Courses are offered in mechanical drawing, sheetmetal drafting, machine drawing, architectural drawing, arts and crafts, electricity, engineering, carpentry, joinery, wood-turning, cabinetmaking, patternmaking, blacksmithing, toolmaking, foundry work, machineshop work, printing, household arts, millinery, bookkeeping and stenography. Four high schools, Crane, Harrison, Lake and Lane, offer instruction in technical and business subjects. A fee of $1 is charged.

NEWCASTLE, PA. The school board has made arrangements for the teaching of Manual Training and Domestic Science. A complete printing outfit with a master printer in charge has been installed. Practically all of the printing for the schools will be done in the printing shop.

FRANKLIN, N. H. A Domestic Science Department has been opened in the high school under the direction of Miss Leavitt, of Ayer, Mass. An appropriation of $1,200 was made for the work last spring.

MINNEAPOLIS, MINN. Supt. F. E. Spaulding and the director of Domestic Science have made arrangements by which the school lunchrooms will market all products of the cooking classes.

MONDAMIN, IA. The school authorities have obtained a public building for the use of the Manual Training and Agricultural classes.

SALT LAKE, UTAH. A room equipped for the teaching of cooking and housekeeping has been opened in sixteen grade buildings, for the benefit of seventh-grade girls. Students in other buildings will have access to the kitchens in these schools. In addition, 23 buildings have been

provided with Manual Training rooms, and two additional buildings will shortly be similarly equipped.

CLINTON, IA. Mechanical Drawing has been added in the high school under the direction of Mr. F. N. Petersen.

CANASTOTA, N. Y. A Domestic Science Department has been opened in the high school. The department has received donations of money and a number of useful utensils.

GLENDIVE, MONT. A Manual Training Department has been opened in one of the grade schools for the pupils of the sixth, seventh and eighth grades. Patternmaking, wood-turning, tinsmithing and general shop work are included in the course.

NEW YORK, N. Y. The board of education has announced a free evening course in proofreading, copy editing, and typography for job compositors, linotype and monotype operators, proofreaders and editorial workers at the Stuyvesant Evening Trade School.

THE enrollment in Domestic Science in the high school at Tuscola, Ill., has been so heavy that three classes have been found necessary. Women of the city who desire to take advantage of the instruction will be placed in the extra class.

WILLIAMSPORT, PA. The opening session of the night classes in Domestic Science and Sewing was attended by 180 women of the city desiring to enroll. Of these, forty preferred Sewing and 140 Domestic Science. An Industrial School has been opened in the board of education rooms. Instruction is offered in shop drawing and sketching, blueprint reading and shop arithmetic, and classes are arranged to accommodate metalworkers, machinists, woodworkers and electricians.

PARKER, S. D. A Domestic Science Department has been opened at an expenditure of about $1,000.

WEST CHESTER, PA. The school authorities and citizens have made arrangements for the introduction of vocational training.

GREEN BAY, WIS. A course in painting, including pen and ink drawing, cartooning, water coloring and mechanical drawing has been added in the West High School. Woodworking and Mechanical Drawing have been made elective for the fourth year.

KANSAS CITY, MO. The number of prevocational grade schools has been increased from three to six.

BURLINGTON, VT. An elective course in cooking for grammar-grade students has been introduced.

WASHINGTON, D. C. A new school building, to accommodate classes in cooking and housekeeping, is nearing completion.

WAUSAU, WIS. A course in Domestic Economy has been introduced in the high school. The subject may be begun in the first year and continued thru the four years. In the industrial department, plumbing and cement work have been added.

ST. PAUL, MINN. Mr. J. Madison has been appointed instructor in Manual Training.

MISS HANNAH HILL, formerly of Herkimer, N. Y., has accepted a position as instructor in Domestic Science at Pratt Institute, Brooklyn, New York City.

WENTWORTH INSTITUTE, Boston, Mass., has added two instructors to its faculty in the persons of Mr. Cleveland C. Soper, of Niagara Falls, N. Y., and Mr. Walter C. Voss, of Chicago, Ill. Mr. Soper will teach machine drawing, and jig and tool designing and Mr. Voss will teach architectural construction.

MARSHFIELD, WIS. An Industrial School for boys and girls has been opened under the direction of R. J. Carver.

SAN ANGELO, TEX. The Sewing and Manual Training Departments have been enlarged and additional instructors employed.

TROY, N. Y. With the exception of new buildings, every school in the city with seventh and eighth-grade classes, has been equipped for instruction in Manual Training.

NEW BRITAIN, CONN. Domestic Science has been introduced at St. Mary's Parochial School, under the direction of a special teacher.

PHILADELPHIA, PA. A course in practical salesmanship has been opened at the William Penn High School with an enrollment of more than forty young women. Two of the large department stores have offered to cooperate with the school authorities in carrying on the classes. The school offers the textbook work and the stores the practical training, the latter paying for the time spent. Two years will be devoted to the subject and opportunity is given for the enrollment of students from the commercial department of the school.

THE BELOIT, WIS., CONTINUATION SCHOOLS have issued a handsome circular illustrating the courses offered in the night and day continuation classes. The second annual report of the Industrial and Continuation evening schools has also been issued. Over 500 persons who would otherwise have received no further education were enrolled, and to carry on the work three full time teachers and twenty-six evening school teachers were employed.

LAFAYETTE, IND. A complete printing plant, including type, job press, paper cutter, stapler and other accessories has been installed in the Vocational School.

FORT PAYNE, ALA. A Manual Training Department has been opened at the DeKalb County High School. The students will construct a number of desks and will do the necessary carpentry for the schools and for citizens of the town.

SPRINGFIELD, MASS. The evening elementary and trades schools opened with a large enrollment. A three-year course is offered in machineshop practice and toolmaking. Applicants for admission to the latter must have had experience in the machineshop. Instruction is offered in plumbing to master plumbers and apprentices.

Examination to be Held.

THE UNITED STATES CIVIL SERVICE COMMISSION has announced an open competitive examination for assistant in rural education for women only, to be held October 27. From the register of eligibles resulting from this examination certification will be made to fill vacancies in this position in the Bureau of Education, Washington, D. C., at salaries of $1,800 a year.

The duties of this position will include the study of rural education, with special reference to the methods of teaching in the elementary grades and the collection and compilation of information relating thereto.

Competitors will not be assembled for examination, but will be rated on the following subjects, which will have the relative weights indicated: 1. Education, 40; 2. Experience, 40; 3. Publications or thesis, 20; total, 100.

An educational training equivalent to that required for graduation from a normal school or college, and at least three years' experience in teaching elementary grades and in preparing teachers for elementary schools, or in supervising rural schools, are prerequisites for consideration for this position. Applicants must have reached their twenty-fifth but not their fifty-fifth birthday on the date of examination.

Application blanks and complete information may be had from the Commission at Washington, or from its offices in New York, Boston, Chicago, New Orleans, San Francisco, etc.

NOW, ARE THERE ANY QUESTIONS?

Readers are urged to ask questions concerning the Industrial Arts. The editors will reply to those questions which they feel that they can answer, and to other questions, they will obtain replies from persons who can answer them authoritatively. Questions should be addressed to THE EDITORS.

Books on Shop Mathematics.

Cleveland, O. Q:—Can you tell me where to get a list of shop mathematics books, and the publishers?—*G. K. W.*

A:—Below is a list of the leading books on "Shop Mathematics." Following each title, is the name of the publisher, and the price:

Blake, C. F.—Mathematics of Machine Design. (1908.) Published by The Industrial Press, 49 Lafayette St., New York City. Price, $0.25.

Breckenridge, W. E.,—*Mersereau,* S. F.,—*Moore,* C. F.—Shop Problems in Mathematics. (1910.) Published by Ginn & Co., 2301 Prairie Ave., Chicago, Ill. Price, $1.

Cobb, H. E.—Elements of Applied Mathematics. (1911.) Published by Ginn & Co., Chicago, Ill. Price, $1.00, net.

Colvin, F. H.—*Cheney,* W. L.—Machine Shop Arithmetic. (1912.) Published by N. W. Henley Publishing Co., 132 Nassau St., New York City. Price, $0.50.

——— Engineer's Arithmetic. (1908.) Published by Henley Co. Price, $0.50.

Gardner, M. L.—Industrial Arithmetic for Girls' Trade Schools. (1910.) Published by D. C. Heath & Co., 623 S. Wabash Ave., Chicago, Ill. Price, $0.50.

Holton, E. E.—Shop Mathematics. (1910.) Published by Taylor Holden Co., Springfield, Mass. Price, $1.25.

Howe, G.—Mathematics for the Practical Man. (1912.) Published by D. Van Nostrand Co., 25 Park Pl., New York City. Price, $1.25.

Marsh, H. W.—Industrial Mathematics. (1912.) Published by John Wiley & Sons, 432 Fourth Ave., New York City. Price, $2.00.

Merriman, M.—Strength of Materials. (1912.) Published by John Wiley & Sons, New York City. Price, $1.

Norris, E. B.—*Smith,* K. G.—Shop Mathematics. Pt. I, Shop Arithmetic. (1912.) Published by McGraw-Hill Book Co., 230 W. 39th St., New York City. Price, $1.50.

Norris, E. B.—*Craigo.*—Shop Mathematics. Pt. 2, Advanced Mathematics. (In press.) Published by Mc Graw-Hill Co., New York City.

Oberg, E. V.—Shop Arithmetic for the Machinist. (1911.) Published by The Industrial Press, New York City. Price, $0.25.

——— Advanced Shop Mathematics for the Machinist. (1910.) Published by The Industrial Press, New York City. Price, $0.25.

——— Tables and Formulas for Shop and Drafting Room. (1909.) Published by The Industrial Press, New York City. Price, $0.25.

Palmer, C. I.—Practical Mathematics. (1912.) Published by McGraw-Hill Co., New York City. Price, $0.75, each.

Pratt, J. A.—Materials and Construction. (1912.) Published by P. Blakiston Sons & Co., 1012 Walnut St., Philadelphia.

Positions Still Open.

Indiana. Q:—I have not secured a desirable position yet. I am well prepared. What do you advise? Are there any positions open yet?—*R.*

A:—Join one of the good agencies and hustle for a good place. There are positions to be had even at this late date.

Jewels Wanted.

Menomonie, Wis. Q:—Where can I buy the White Topaz?

A:—Espositer, Varni Co., New York should be able to furnish this gem. Francis E. Lester Co., Mesilla Park, New Mexico, makes a specialty of this particular stone.

Canned Courses.

Illinois. Q:—What do you think of the courses offered by certain "Systems" for use by Domestic Science teachers?

A:—Not much.

Illinois Courses.

Ogden, Iowa. Q:—How may one secure the Course of Study put out by the Illinois Manual Arts Association?—*C. K.*

A:—The supply of this interesting Report is entirely exhausted.

Concrete Construction Books.

Roseville, Cal. Q:—Please give me addresses of publishers from whom I can obtain literature on concrete or cement building construction.—*Mrs. C. H. T.*

A:—The following books are valuable:

1. *Reinforced Concrete.* Vol. 107, International Library of Technology. International Correspondence Schools, Publishers, Scranton, Pa. (Volume 108 of the same series discusses concrete foundations.)

2. *Popular Handbook for Cement Users.* By M. H. Lewis and A. H. Chandler. Henley Publishing Co., New York City.

3. *Masonry and Reinforced Concrete.* By Webb and Gibson. American Correspondence School, Chicago, Ill.

4. *Reinforced Concrete.* By Buel and Hill. McGraw-Hill Co., New York, N. Y.

5. *Concrete and Reinforced Concrete.* By H. A. Reid. C. M. Clark Publishing Co., Boston, Mass.

The first and third titles are textbooks; the second, fourth and fifth are reference works.

Both the Atlas Portland Cement Co., and the Universal Portland Cement Co., have books on the subject which they will send free of charge.

THE SCHOOL BOARD of Minneapolis, Minn., has adopted a recommendation of Supt. F. E. Spaulding providing vocational courses for boys and girls in the Central High School.

Speaking of the aims of the school, Supt. Spaulding recently said: "I feel there are about one thousand boys and about as many girls in Minneapolis whose time in school must necessarily be short. We aim to give courses in carpentry, machine shop work, sheet metal work, printing and electric wiring for the boys. Courses in cooking, sewing, millinery and other lines may be arranged for girls. I suggest a general preparation be made so that we may adapt our schools to the needs of those who may not fit into the courses offered in the upper grades and high schools."

SUPT. WM. A. WIRT, of Gary, Ind., and DEAN HERMAN C. SCHNEIDER, of the University of Cincinnati, have been elected experts in vocational education for the New York City schools. They have been appointed particularly to study the vocational necessities of the metropolis and to work out a complete system of industrial education, including trade schools, continuation schools, cooperative part-time schools, etc. They will be officially known as advisors to the board of education and will receive annual salaries of $10,000.